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DISK INSIDE

COMPUTE!'s PC magazine

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FOR IBM PCs AND COMPATIBLES

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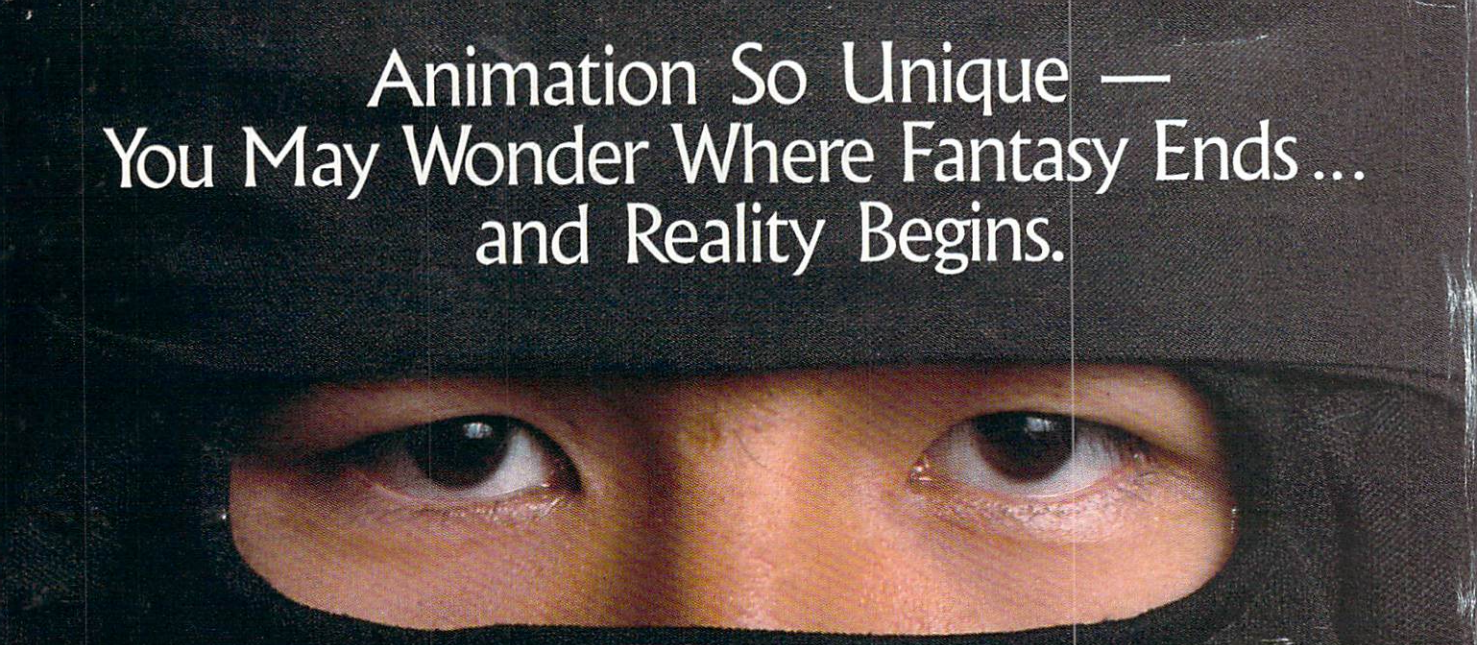

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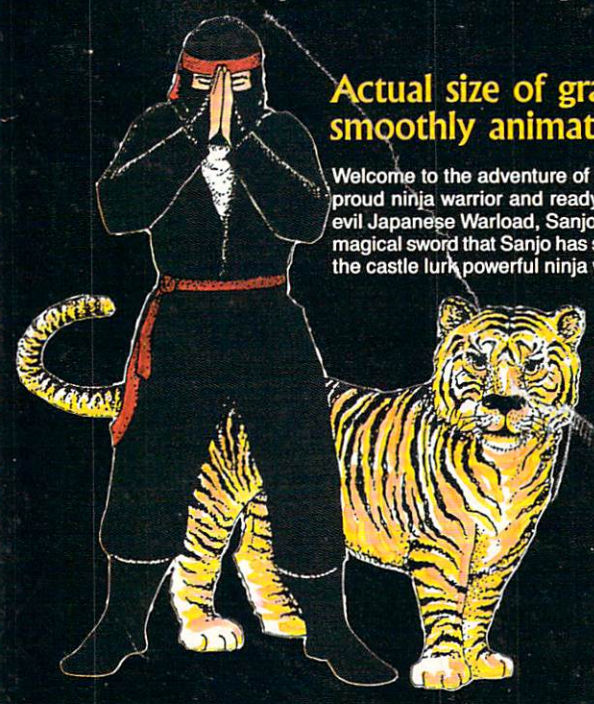

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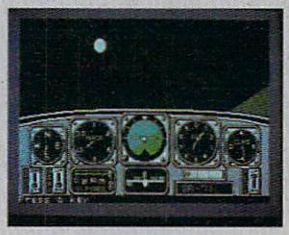

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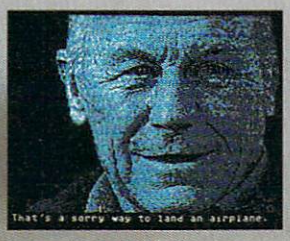

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THE EDITOR'S VIEW

With this issue of COMPUTE!'s PC Magazine, we are no longer including a menu program on the magazine disk. Although the disk menu does make it marginally easier for novices to run our programs, compatibility problems between the hundreds of different IBM and MS-DOS computers prevented some people from using the menu.

It's easy to run our programs without the menu, of course. In general, all you have to do is type the filename of the program at the DOS prompt. For example, on this issue's disk is a program called ROBOKEY.COM. To run it, simply type ROBOKEY. You don't even need to type the .COM extension.

For more details, see the "How to Use the Disk" section elsewhere in the magazine. As always, we recommend reading the corresponding magazine article before running a program for the first time.

Eliminating the menu program also conserves more than 50K of disk space, which leaves us room to bring you more high-quality programs. In this issue, for instance, is an outstanding package of DOS enhancements called "EZDOS." It adds more than 50 new DOS commands to streamline your computing. You can now back up an entire day's work with a single command and perform dozens of other routine tasks much more efficiently. Best of all, EZDOS is extremely compact in relation to its power (about 26K).

Another clever program is "RoboKey." It's like an alarm-triggered robot that can enter any series of keystrokes you want into your computer while you're gone. You simply set the alarm for any time in the next 24 hours and type the keystrokes you want RoboKey to retype later. When the alarm goes off, RoboKey takes over. It can carry out DOS commands, run programs, and even download information over the phone lines while you sleep.

If you don't want anyone to interfere with your computer while you're away, try "Keyboard Lock-Out," another memory-resident program in this issue. When you activate it by pressing a hot-key combination, it blanks the screen, locks the keyboard, and flashes an unmistakable message: *COMPUTER IN USE*. Only someone who knows the correct hot-key can unlock it. You can change the hot-key combination if you want, too.

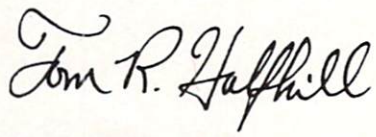
On the lighter side, we have three programs for entertainment and recreation. "Burger Blaster" is an arcade-style action game written in *Turbo Pascal*. The object is to shoot down flying beef patties, tomato slices, pieces of lettuce, and sesame-seed buns in the right order to build a coherent hamburger.

"Wrimage" is a nicely done word-guessing game for all ages. It tests vocabulary skills on three different levels of difficulty, and we guarantee the hardest level will challenge even the most astute lexicographer. Up to six people can play at once, so it makes an ideal party game. And, since you can feed your own word lists into the program, you can turn it into an educational tool for youngsters.

PC-Art is our feature program in this issue's "Best of the Boards" column. It's a colorful, easy-to-use drawing program with pop-up menus and other handy features. You don't even need a mouse or a joystick.

And for programmers, we have a useful tutorial on trapping disk errors in *Turbo Pascal*, complete with sample procedures on the magazine disk, ready to include in your own programs.

Enjoy your magazine, and let us know what you think.



Tom R. Halfhill, Editor

Attention PCjr Users

A number of IBM PCjr users have inquired about the compatibility of programs in COMPUTE!'s PC Magazine. Some programs, including the disk menu in the first issue, won't work properly on the PCjr.

Ironically, the PCjr is probably the least compatible PC compatible ever made. Some commercial software packages that are written to work on IBM PCs, XTs, ATs, and true compatibles have problems with the way the PCjr reads the keyboard and other differences. Some of these differences are shared by early Tandy 1000s.

Since several hundred thousand of these computers were sold and are still in use, we're working to make all our programs fully compatible. We expect the majority of our programs will be compatible with the PCjr from now on. If a program will not work on a PCjr, that information will be noted in the introduction to the article.

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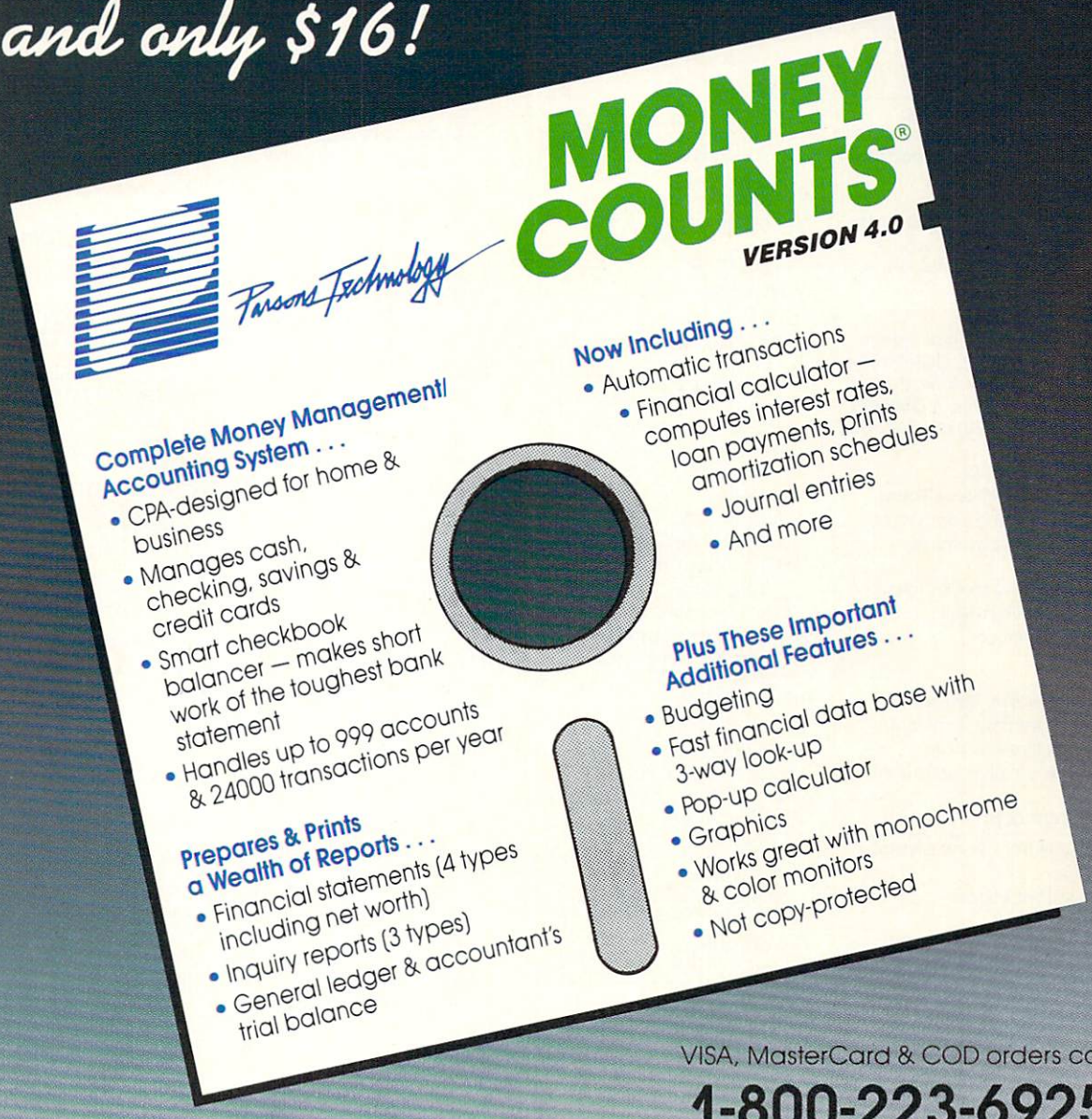
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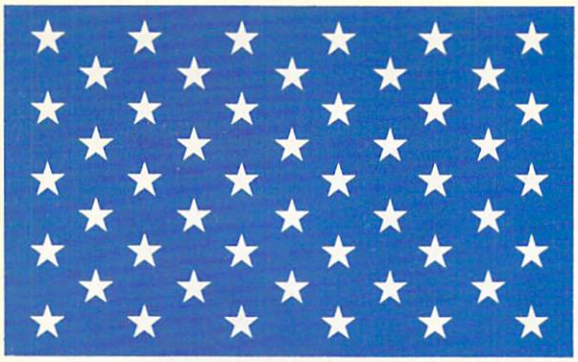

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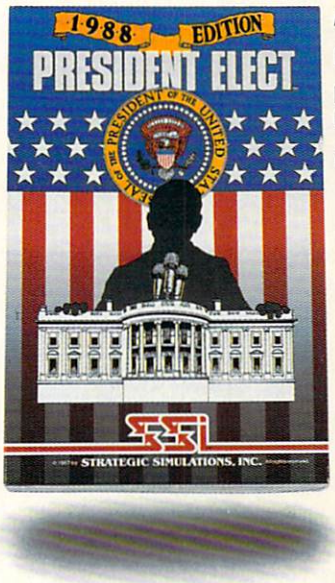

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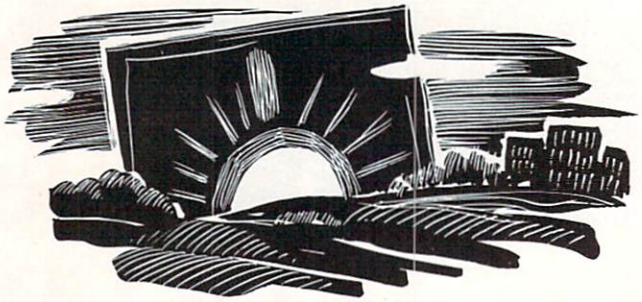

Microsoft Rolls On

Bill Gates and company were on a nonstop roll this fall with a two-for-one stock split and a flurry of hardware and software announcements.

Microsoft's Mach 20 speed-up card ($495) brings AT-class performance and memory capabilities to older PCs. The card includes an 80286 microprocessor and a mouse port, and will also support Microsoft's generic version of the OS/2 operating system—when OS/2 becomes available. Two optional daughtercards can be added to the Mach 20. The Memory Plus card ($395 for 512K) can provide up to 3.5 megabytes of expanded memory. The Disk Plus card ($99) allows use of high-density 5¼-inch and 3½-inch floppy disk drives.

Microsoft also shipped *Bookshelf*, a $295 system for CD-ROM drives. (CD-ROM stands for Compact Disc Read Only Memory; it's a read-only storage system based on the same type of compact discs used in audio.) *Bookshelf* allows users to access the complete text of ten major reference works from within most popular word processors. It includes the *World Almanac, American Heritage Dictionary, Roget's Thesaurus, Bartlett's Familiar Quotations, Houghton Mifflin Usage Alert and Spelling Verifier,* the *U.S. ZIP Code Directory,* and several other reference books.

Microsoft Works ($195)—a popular integrated software package on the Apple Macintosh—was released for the PC, as well as new versions of the Microsoft Mouse, Microsoft *Word,* Microsoft *Chart,* and Microsoft *Windows.*

Arlan R. Levitan

Run Silent, Run Deep

Toshiba is moving full-speed ahead to introduce and promote new products, even though it still appears to be on a collision course with Congressional efforts to ban the sale of all Toshiba goods in the U.S. (See "Trouble for Toshiba," November 1987.)

Sales of the new 6.4-pound T1000 laptop are extremely strong, in spite of the negative publicity surrounding a Toshiba subsidiary's sale of manufacturing technology to the Soviet Union which makes it possible for the Russians to develop more advanced submarine propellers. For around $1,000, the Toshiba T1000 laptop offers full PC compatibility in a compact package with 512K of RAM, a built-in 3½-inch microfloppy drive, and quick-booting MS-DOS in ROM.

In August, current owners of Toshiba laptops received a letter of apology from Toshiba concerning the propeller deal. Meanwhile, Toshiba representatives have been spending long hours on Capitol Hill, apologizing.

Toshiba America, apparently encouraged by the success of the T1000, has announced the T5100, an 80386-based portable that weighs 15 pounds, plus a new laser printer. Toshiba also wants to entice several U.S. firms into licensing new technology that allows up to four megabytes of data to be stored on a 3½-inch microfloppy disk.

The Rentware Controversy

Colorado Congresswoman Pat Schroeder may have given up her bid for the Democratic presidential nomination, but she hasn't given up on H.R. 1743, a bill intended to halt the rental of computer software.

In recent years, some computer stores have started software rental clubs, allowing members to rent programs for a flat fee. They work much like videotape rental clubs, but Schroeder's camp maintains that software rental is merely a cover for organized software piracy. Proponents of software rentals argue that users need to find out if a certain program will meet their needs, and that entertainment programs are usually played for only a few days before the user tires of them.

Which side will win? There are precedents to support both views. Several years ago, the movie industry failed to push through a similar measure that would have banned videotape rentals. But a bill that prohibits the rental of record albums was passed in 1983, although this law is openly flouted by some record stores.

Life In The Fast Lane

Compaq recently upped the ante in the high-speed sweepstakes by announcing two new 80386-based PC compatibles.

According to Compaq, the Deskpro 386/20, equipped with a 20-megahertz 80386 microprocessor and special Intel cache controller, is up to 50-percent faster than most 80386-based systems running at 16 megahertz (including the IBM PS/2 Model 80). The new Portable 386 packs the same processing power in a shoebox-sized package. Both systems eschew the 3½-inch disk drives used in the IBM PS/2 line; they're sticking with 5¼-inch drives, at least for now.

Both systems also carry a hefty price to match their prodigious performance. The Deskpro 386 ranges from $7,500 to $12,500, depending on configuration. The Portable 386 is $10,000 when equipped with a 100-megabyte hard drive. The budget-conscious may opt for a 40-megabyte unit for only $8,000.

Speed demons: The new Compaq Deskpro 386/20 and Portable 386 are among the fastest PCs available—and also among the most expensive.

Lower Prices For 80386 Upgrades

Intel has reduced the price of its Inboard 80386 accelerator board to $1,595, making the move up to 80386 processing even more attractive for current AT and AT-compatible owners. The Inboard 386 simply attaches to the AT motherboard.

Prospective purchasers, however, should not be strangers to monkeying with the innards of their systems and must verify that their present disk controller, display, and other expansion cards will work properly with a 16-megahertz 80386 system.

Intel's move has lowered the street price of the Inboard to about $1,000, making it a genuine bargain for computing in the fast lane.

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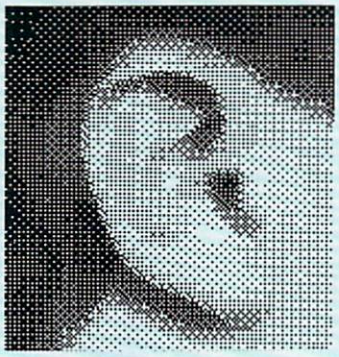

News, rumors, and gossip heard around the PC community.

Chomping On The Bit

Some owners of systems based on Intel's 80386 processor chip may be **in for a surprise** when they attempt to run 32-bit software. Intel sells several types of 80386 chips, including a low-cost version that has **failed 32-bit tests** and is intended for use only with **16-bit software.** A few bargain-basement clone suppliers are said to be shipping units equipped with the offending chips, which are marked *16 BIT S/W ONLY* on the chip surface. Manufacturers place part of the blame on **chip distributors,** who, they claim, fill their orders for 32-bit chips with the low-grade 80386s. Distributors, in turn, charge that some **manufacturers** knowingly order the 16-bit chips due to their lower cost and a temporary shortage of 32-bit 80386s. Intel has stated it will not assume responsibility for replacing the 16-bit 80386s with fully capable versions, although a number of manufacturers say they'll **eat the cost** of updating any systems they've sold with 16-bitters.

Breaking The Radio Shackles

Tandy is again rumored to be bandying about the idea of marketing its computers in venues **other than Radio Shack outlets.** (Similar rumors a few years ago during the home computer wars came to naught.) Although dealers resist the idea, Tandy has been reducing the number of Radio Shack Computer Centers and is test-marketing the distribution of some software products through normal retail channels. Some Tandy board members are rumored to feel that the company's penetration into the business market is hampered by the **home consumer association** with the Radio Shack logo. Two names that keep popping up as potential "limited" distributors of Tandy products are **Businessland** and **Entre.** Under one possible distribution arrangement, these chains might be allowed to sell Tandy products directly to corporate accounts, but would not be allowed to display them in public showrooms.

Blue Sues

IBM is **flexing its muscle** in the courts over trademark rights. Big Blue recently filed suit against several expansion-card manufacturers who referred to their products intended for use in IBM's new computer line as *PS/2* expansion cards, and even jumped on companies that used the characters */2* in product names. Can IBM make it stick? Could be. Earlier this year, IBM won a ruling in U.S. District Court that **prohibited a clone manufacturer** from using the terms *AT* or *XT* in its product names.

Hard Disk Inflation

While most of us are still foolin' with floppies, 20- and 30-megabyte hard drives **may become passe** among the power user set by the end of 1988. Several hard drive manufacturers are said to have developed low-cost 3½-inch hard disks with thin-film media that store **at least 100 megabytes.** Prices may list for **less than $500.** Prototypes were supposed to be shown at the Spring COMDEX trade show held in Las Vegas in early November.

And Now Epson, Too

Epson is adding to the PC Convertible's woes by jumping into the burgeoning computing-on-the-run market with **its first PC-compatible laptop.** Although Epson was a pioneer in laptop computing, its HX-20 and PX-8 systems weren't compatible with MS-DOS and never caught on. The new 12-pound **Epson Equity LT** may turn out to be another story, however. It's available in multiple configurations, with backlit or supertwist LCD screens, two 3½-inch drives, and 640K of RAM ($1,895), or with a 20-megabyte hard drive ($2,995). Epson also released the Equity II+, an AT compatible with a base price of $1,595.

Nobody's Perfect

At least **three glitches** have surfaced in IBM's Personal System/2 line of computers. Dealers have been reporting a higher than normal failure rate for the Model 8513 12-inch color monitor due to **bad power supplies.** Defective units typically fail immediately upon powerup. The PS/2 Model 30, the low-end model in the line, has power-supply problems of another ilk. When outfitted with IBM's laser-printer adapter card, the Model 30's small power supply is likely to be **overtaxed** by the addition of other expansion cards. And the PS/2 Model 60's BIOS chip is said to be responsible for **erroneous error codes** 162 and 163 during system startup and incorrect date/time settings. The problem will reportedly be corrected with a DOS patch late this fall. Until then, IBM advises Model 60 owners who encounter the problem to set the correct date and time from DOS immediately before shutting down their machines.

Good Old-Fashioned Paper Mail

Word from Washington has it that the Federal Communications Commission (FCC) may "reconsider the timing" of its decision to impose local telephone system access charges on commercial information services in January 1988. The FCC has been **deluged with protests** opposing the surcharges. According to Tymnet, a packet-switching service, 3964 letters on the controversy were filed by September 14—and **all but five** opposed the FCC ruling.

Whisper To The Ear

Got something you want to get off your chest? ***The Ear wants to hear.*** *Mail missives to The Ear, c/o COMPUTE!'s PC Magazine, P.O. Box 5406, Greensboro, NC 27403. All sources treated confidentially.*

Spreadsheet Sharks Are Circling

Lotus Development, one of the last holdouts for copy protection, has announced that Version 3 of *Lotus 1-2-3* **will not be copy-protected.** Industry analysts believe the announcement (and Lotus's recent diversification of its product line) were prompted by the expectation of **fierce competition** from new nonprotected spreadsheet programs by Borland International and Microsoft. Many Fortune 500 power users are said to be ready to jump the Lotus ship for Microsoft's jackrabbit-quick *Excel* spreadsheet, newly available on the PC. And then there's Borland's *Quattro* spreadsheet. Early beta-testers report that the $195 program is file- and macro-compatible with *Lotus 1-2-3* Version 2.01, is much faster, and more feature-laden. *Quattro* also is said to have **outstanding graphics** capabilities.

IBM Portable/PC-RT Déjà Vu

Sales of the IBM Convertible **continue to lag** far behind the popular NEC, Zenith, and Toshiba laptop computers. The Convertible, which has undergone two major overhauls in its brief life, is still significantly slower, heavier, and more expensive than its competitors. And things **aren't getting any easier** with Tandy, Olivetti, Sharp, Hewlett-Packard, Ricoh, and Datavue leaping into the fray. Rumor has it that the Convertible may be quietly "withdrawn from active marketing" after the end of 1987. Is there a replacement in the wings? Watch for a U.S.-manufactured derivative of IBM-Japan's hard disk–equipped Model 5535 in late spring of '88.

Hard To Imagine

Although IBM's latest PS/2 system, the Model 25, is not available with a hard disk, we've verified that it does work with slender hard disk cards such as **Plus System's HardCard.** Installing the 20-megabyte HardCard was a tight squeeze, but the Model 25 can boot from and access the hard drive with no problems. This does, however, **crimp the expandability** of the Model 25, leaving only one of the system's two slots open. Also, opening and closing the Model 25 is decidedly more difficult than working on any other machine we've seen and should not be attempted by novices. It's **easy to damage** the system by exerting too much force on parts of the system chassis. The presence of a hard drive connector socket on the Model 25's motherboard indicates that IBM may someday offer a hard disk for this machine that doesn't eat up an expansion slot, mounting in the space now used for a second 3½-inch microfloppy drive.

Tumblin' Price

Plunging PC prices hit the no-name clone market this fall, resulting in **record-low system prices** for hobbyists who elect to slap their own PC compatibles together out of separate components. By September, all of the components required for an XT-compatible system with 20-megabyte hard disk drive and monochrome graphics could be had for **less than $600,** and complete AT-compatible systems dipped **under $1,000.** The price of 80386-based motherboards continued to drop as well, prompting many insiders to predict **$1,500 80386 clones** by early spring of '88.

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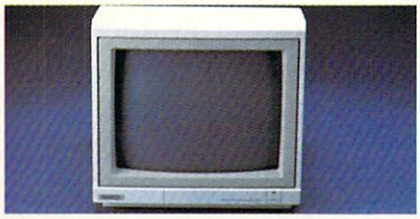

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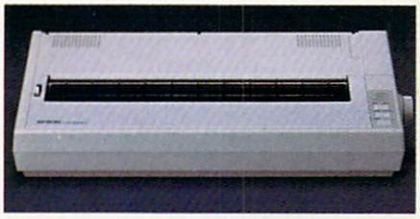

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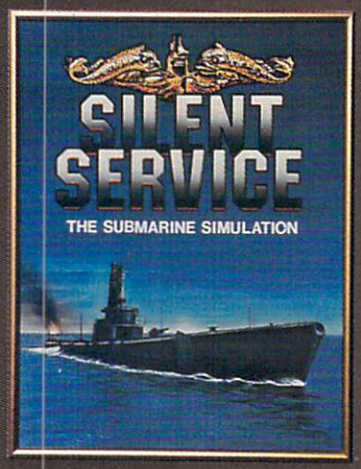

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Do you have a question or a problem about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to PC Feedback, COMPUTE!'s PC Magazine, P.O. Box 5406, Greensboro, NC 27403. We regret that we cannot provide personal replies to technical questions.

Starting An Auto

I have an IBM PCjr I use for word processing. When I boot from DOS, it automatically starts in the 40-column screen format. I always have to type MODE 80 to get it to the 80-column screen I use all the time. Is there any way to end this nuisance?

Herbert Baird

If there are any commands you always enter when you start up a computer, let an AUTOEXEC.BAT file do the typing for you. AUTOEXEC.BAT is a file of DOS commands which you prepare and store on your startup disk. When you boot the computer with this disk, the computer looks for an AUTOEXEC.BAT file on drive A (or drive C if you have a hard disk) and executes its commands just as if you had entered them yourself at the keyboard.

You can make an AUTOEXEC.BAT file with any word processor or text editor that can save files in ASCII format (that is, plain text files, free of special formatting codes). A faster way to make short AUTOEXEC.BAT files is to use the COPY CON command. This is a method of using DOS to copy the commands you enter at the keyboard into a disk file. (CON, for CONsole, is what IBM calls the keyboard/screen combination.)

Here's an example. Put your DOS disk in drive A and enter

COPY CON A:AUTOEXEC.BAT

After you press Enter/Return, the cursor moves down a line. Now type

MODE 80

After pressing Enter/Return again, press the F6 function key to end the AUTOEXEC .BAT file. Now press Enter/Return one more time; DOS writes the AUTOEXEC .BAT file on the DOS disk.

To test the AUTOEXEC.BAT file, leave the DOS disk in drive A and press the Ctrl, Alt, and Delete keys simultaneously to restart the computer. When the computer has booted, you'll have your 80-column screen without typing any commands yourself, and you'll always have it when you boot from this disk.

Note that any AUTOEXEC.BAT file must be on the disk from which you boot the computer, and that in this case, the MODE program must be on the same disk, too. (MODE is a program that you'll find on your DOS disk.)

For more information, see "Getting Started with Batch Files" in the November 1987 issue of COMPUTE!'s PC Magazine.

By Your Own Bootstraps

I bought an IBM compatible just a few weeks ago. I learned that to make it run, I have to put the DOS disk in drive A to "boot it up." Why didn't I have to do this with my Commodore 64?

The term boot up *is derived from the expression "Pull yourself up by your own bootstraps." Here's why.*

For a computer to access a disk drive, it needs a special program called a disk operating system *(DOS). DOS runs in the background, so to speak, taking care of routine disk functions so the computer is free to run your application program. When your application needs to access the disk drive—to save a file, for instance—it relies on DOS to get the job done.*

The Commodore 64 is somewhat unique in that its disk operating system is built into read only memory *(ROM) in the disk drive. ROM consists of special memory chips that retain their data even when the computer's power is shut off. The data is permanently stored in ROM when the chips are manufactured. Since the Commodore 64's DOS is stored in ROM, in effect it's an integral part of the computer system—instantly available when the computer is switched on.*

The vast majority of computers don't keep DOS in ROM. Instead, they must load DOS from disk when the system is switched on. Most IBM PCs and compatibles begin by reading a small portion of the DOS disk in drive A called the boot sector. *The instructions there tell the computer where to find further instructions on the DOS disk. When the computer finishes booting, it's ready to go to work. So the computer "pulls itself up by its own bootstraps" because it tells itself where to find its own instructions.*

For a long time, Commodore computers were among the very few which contained DOS in ROM. But lately, some IBM compatibles have adopted this approach—such as the Tandy 1000 HX and the Toshiba T1000 laptop. There are both advantages and disadvantages to this. If DOS is in ROM, you don't need a DOS disk to start the computer, but there's also no way to upgrade DOS without replacing a ROM chip. IBM DOS began with version 1.0 and is now in version 3.3. Upgrades are easier when all that's needed is a new disk.

A Little About Languages

Which of the popular programming languages today (BASIC, Pascal, C, Prolog, Forth, COBOL, FORTRAN, and so on) could best be used by a beginner?

Two of these languages, BASIC and Pascal, were originally designed to teach programming. BASIC (Beginner's All-purpose Symbolic Instruction Code) was designed at Dartmouth College in the early 1960s, and Pascal was designed by Niklaus Wirth in the late 1960s. Both languages, however, have grown from instructional languages to mature general-purpose languages which can be used to write programs that range from games to database managers.

Which language is better for beginners? Any definitive answer to this question would only provoke outcries of protest from advocates in the opposite camp. Some Pascal proponents claim you'll handicap yourself if you begin with any language other than Pascal, while proponents of BASIC insist that their language's unstructured simplicity is less intimidating to beginners.

Two facts about languages are pertinent. One is that (except for BASIC) all of the languages listed above require an extra step to be performed before you can test-run your program. The step is called compiling. *In this step, your program instructions are translated into binary numbers computers understand. Depending upon the length of your program, the efficiency of the language compiler, the speed of your computer, and whether or not you have a hard disk drive, the compilation step can take anywhere from a few seconds to several minutes.*

The versions of BASIC that come with most IBM PCs and compatibles (including PC-BASIC and GW-BASIC) don't require this extra step. Known as BASIC interpreters, *they translate your program instructions into binary and execute them at the same time. Although interpreted programs generally run more slowly than compiled programs, the advantage is that you can immediately see the fruits of your work. You can make a slight change in your program, test-run it, observe the effects, and correct any errors immediately. This advantage has prompted the release of a few Pascal interpreters recently, although the vast majority of Pascal languages (such as Borland International's* Turbo Pascal*) are still compilers.*

In the case of some compiled languages such as COBOL and FORTRAN (which are ordinarily taught on college mainframe computers), 20 minutes can pass between the time you finish your program and the moment you see it run—your program must be compiled and run along with perhaps dozens of others.

Another fact to consider—and an important reason why BASIC has become so widespread—is that almost every personal computer ever sold (including most PC compatibles) has come with a BASIC interpreter. Sometimes BASIC is built into read only memory (ROM), and sometimes it comes on disk. Even if BASIC didn't come with your PC, you almost always get it when you buy DOS, while any other language is an extra expense. You can experiment with the BASIC you already own and learn whether programming is an experience you enjoy. Later, you can try another language if you like.

Lately, some excellent compilers for the BASIC language have become available for IBM PCs and compatibles, such as Borland's Turbo BASIC *and Microsoft's* QuickBASIC. *If you want, you can write your program with a BASIC interpreter for easy testing and debugging. Then, when you're satisfied it's finished, you can compile it for maximum performance. This gives you the best of both worlds.*

These days you don't even have to learn a programming language to learn how to program. Another approach is to use a high-level application program such as Lotus 1-2-3 *or Ashton-Tate's* dBase III. *These programs allow you to construct complex macros and custom applications, which are actually forms of programming. Many colleges now offer courses in spreadsheet and database programming.*

What's In A Name?

I spent hours typing in a BASIC program, and when I finished, I tried to save a copy of the program to disk. Following the manual's instructions, I typed the following:

SAVE "\CARPAY"

The compatible I use responded with numerous error messages like *Too Many Files.* Eventually, I lost the whole program and was ready to commit computercide. How do I save programs in BASIC?

John Thomas

It's a frustrating experience to lose hours of work on a computer, and unfortunately it happens to everyone—even experts—at some point in their work with computers. What happened in this case is that BASIC expected a filename, *but you inadvertently gave it a* directory name *instead. (Sometimes directory names are referred to as* pathnames.*)*

BASIC uses the same file- and directory-naming conventions used by DOS, so what follows applies to DOS as well as BASIC. Here's a brief explanation of file and directory names.

You can think of a floppy or a hard disk as a filing cabinet where information is stored. The cabinet can have one drawer or many drawers. You can put folders containing information in each drawer. A directory is like a drawer in the cabinet, and a file is like a folder in a drawer. If you have a file to store, you must tell DOS which drawer to put the file into.

Files have names, of course, but so do drawers. Filenames and directory names look very similar—each can be up to eight characters long with an optional extension of one to three characters following a period. Valid filenames and directory names include FILENAME.EXT, PROGRAM.BAS, TESTFILE, MYFILE.T, and CARPAY. To tell DOS the difference between filenames and directory names, you precede a directory name with the backslash character (\). For example, \PROGRAMS.BAS could be the name of a directory for storing BASIC programs, while PROGRAM.BAS could be the filename of a BASIC program stored in that directory.

A simple DOS command lets you create a directory on a disk and give it a name. The command is MD, for Make Directory. At the DOS prompt (not the BASIC prompt), type

MD *dirname.ext*

Substitute your own valid directory name and optional extension for dirname.ext. *And don't forget to type the backslash character (\), not a forward slash (/).*

When you press Enter/Return, DOS makes the directory (drawer) on the disk in the current drive. If you enter DIR at this point, you'll see your directory name with <DIR> after it.

Once a directory is created, you can store files in it. If you want to put a file into a specific directory, you must tell DOS the directory name when you tell it the filename. For example, to save a BASIC program with the filename CARPAY into a directory named PROGRAMS, enter this command while in BASIC:

SAVE "\PROGRAMS\CARPAY"

Notice there are two *backslashes in the command above. It's necessary to surround the directory name with backslashes to separate it from the filename when used in this manner. DOS knows the last name in such a command is always a filename.*

Now, without leaving BASIC, call a disk directory with the FILES command. Don't panic when your program, CARPAY, doesn't show up in the directory listing on the screen. It's stored in the PROGRAMS directory. To get a listing of this directory, enter

FILES "\PROGRAMS"

You'll see a new directory listing on the screen with CARPAY.

You don't have to use directories, of course. They're usually used with hard drives when there are lots of files to keep organized. You may not need to make directories on a floppy disk, but you can if you want to.

To save your BASIC program on disk without putting it in a directory, enter this command:

SAVE "CARPAY"

Without a leading backslash, BASIC assumes that CARPAY is a filename and saves it in the current directory, which is ordinarily the main directory, or root directory, *of the disk. To distinguish directories you create from the root directory, these extra directories are often called* subdirectories.

IBM PCs and compatibles couldn't use subdirectories until DOS 2.0, so they aren't available if you're using an earlier version of DOS. Some software written before DOS 2.0 won't let you use subdirectories with filenames, either. Use caution with older software, even though it otherwise works well under later DOS versions.

Showing Your True Colors

I have ANSI.SYS installed in my CONFIG.SYS file. How can I use it to change the default screen colors?

Phil Donovan

When ANSI.SYS is installed, it acts like a watchdog that monitors everything enroute to the video display. (If you're unfamiliar with ANSI.SYS or how to install it, you'll find an explanation in "Readers' Feedback" in the November 1987 issue. You can also consult your DOS manual.) ANSI.SYS watches for combinations of characters called escape sequences. *This term derives from the fact that they always begin with the Escape character—the character generated when you press the Esc key.*

Following the Escape character in the escape sequence is a left bracket ([ ). When ANSI.SYS notices this particular combination of characters, it considers what follows to be a command to perform some action. Among other things, there's a command to change the default screen colors. Therefore, to change screen colors, all you need to do is send the correct escape sequence to the screen.

You can't do this at the DOS prompt by pressing Esc and then typing the rest of the sequence. (If you press Esc, you'll merely see the cursor drop down a line.) DOS must be tricked into accepting the Escape character, and one trick is to use the DOS PROMPT command. Another is to use the DOS TYPE command to print a file that contains the escape sequences on the screen. Here's how to do both.

The PROMPT command is ordinarily used to change the familiar DOS prompt to something different, but it can be used to enter the Escape character, too. This is represented in the PROMPT command by the characters $e. *(Note that* e *is always lowercase.) For instance, enter the following command at the DOS prompt to change the default character color to blue:*

PROMPT $e[34m

When you press Enter/Return, you'll notice the prompt appears in the new color. If you clear the screen with the CLS command, any new text displayed afterward is blue. You'll also notice that the familiar DOS prompt has disappeared. You can restore it by entering

PROMPT

Note that nothing is appended to this command. You'll always need to perform this step when you use the PROMPT command to set colors.

You can similarly set the background color to white with the command

PROMPT $e[47m

Or, you can combine the two commands and set both the text and background colors at once:

PROMPT $e[34m$e[47m

Notice that, in these examples, the sequence ends with a lowercase m, *which is another part of the code. The* m, *like the* e, *must always be entered in lowercase.*

To use the TYPE command to send escape sequences, you must have a word processor or text editor that allows you to enter the Esc character. (The DOS program EDLIN is one of these.) Many text editors display a left arrow (←) to show an Escape character, but this isn't always the case. EDLIN, for instance, shows it as ^V. If your text editor doesn't print some kind of character on the screen when you press Esc, it probably won't enter the character. Check your manual for more information.

Let's assume you can at least use EDLIN to enter the Escape character. After entering it, type the left bracket and the rest of the sequence as shown above. Save the sequence on disk. Then, at the DOS prompt, enter

TYPE ***filename***

Substitute the name of your file for filename. *When you TYPE this file, ANSI .SYS recognizes and acts upon the escape sequence.*

You can have more than one escape sequence in a file. Enter them on separate lines, each line ended with a carriage return. The following example sets the text color to red and the background to white:

<Esc>[31m
<Esc>[47m

where <Esc> *represents the Escape character entered with your text editor.*

Another way to include more than one command in a file is to combine the number codes, separating them by a semicolon:

<Esc>[31;47m

In this version, the Escape–left bracket combination is entered only once at the beginning of the sequence, as is the concluding m.

You'll notice that when you TYPE the file, the escape sequence itself can't be seen on the screen. That's because watchdog ANSI.SYS removes its own commands from the flow to the screen before you can see them. In fact, a good way to determine whether ANSI.SYS is properly installed is to TYPE a file containing escape sequences. If you can see the codes on the screen, then ANSI.SYS isn't on board.

You'll save time if you include either the PROMPT or TYPE command in your AUTOEXEC.BAT file. Be sure that both ANSI.SYS and AUTOEXEC.BAT are on the boot disk.

The following is a table of foreground and background colors and their number codes. The general escape sequence formula is <Esc> [numbercode m *(but without spaces between the characters).*

Color	Foreground	Background
Black	30	40
Red	31	41
Green	32	42
Yellow	33	43
Blue	34	44
Magenta	35	45
Cyan	36	46
White	37	47

ANSI.SYS is capable of much more than setting default screen colors. Unfortunately, the DOS manuals supplied with most computers contain very little information about its capabilities. However, there are several excellent DOS reference books that contain this information. One is Supercharging MS-DOS *by Van Wolverton (Microsoft Press, 1986).*

Copy Cats

I know I can copy all the files on drive A to drive B by typing *COPY A:*.* B:*. I also know I can do the same thing by typing *DISKCOPY A: B:*. But what's the difference? Is there any?

One important difference is that the COPY command adds the source disk files to any files already on the destination disk. Therefore, the destination disk won't be an exact copy of the source disk—it will contain all of the files from the source disk in addition to the files that already existed on the destination disk.

The DISKCOPY command produces a mirror image of the source disk on the destination disk. If you use DISKCOPY, therefore, you'll overwrite any files already on the destination disk. Another difference is that COPY is an internal DOS command—one that works without the DOS disk in the current drive. DISKCOPY is a separate program which must be loaded from the DOS disk.

Also, the COPY command copies only the files that show in the directory listing. Some files, however, don't appear

in the directory. When you format a disk with the /S (for System) option, DOS puts three files on the new disk. One of these is COMMAND.COM. The others are IBMBIOS.COM and IBMDOS.COM (these are sometimes called IO.SYS and MSDOS.SYS with MS-DOS compatibles). Of these three, only COMMAND.COM shows up in the directory—the other two are called hidden files. *So the COPY command transfers only one of the three system files to another disk.*

For this reason, you can't assume that, because COMMAND.COM appears in a directory listing, the hidden system files are also present. Likewise, you can't assume that, because COMMAND.COM doesn't show, the hidden system files aren't on the disk. If you try to boot a computer from a disk without the hidden files, you'll get an error message from DOS. If you boot a computer with the wrong system files, you might also encounter strange bugs when using DOS commands.

How can you tell if the hidden system files are on a disk? This is something you need to know if you carry disks from one compatible to another—the system files differ between different computer makes and versions of DOS. IBM's PC-DOS doesn't provide a way to show whether hidden files are on the disk. But MS-DOS, shipped with most PC compatibles, has a program called CHMOD which makes hidden files show up in directory listings. Some disk utility programs (such as "EZDOS," found elsewhere in this issue) also can reveal hidden files.

If you must be certain whether or not the system files are on a disk, it's best to reformat the disk with or without the system files as you choose, and then copy whatever other files you want onto the disk with the COPY command.

Using Our Disk With A Hard Drive

How do I use COMPUTE!'s PC Magazine disk on a computer system with a hard drive?

Donald Redding

With this and subsequent issues, just copy the contents of the magazine disk to your hard drive. You can copy every file with the command COPY A:.* C: (assuming your hard drive is installed as drive C), or you can issue separate commands to copy only the files you want. If you want to copy the files into a special directory, you can, for example, make a directory called PC-JAN88 for this issue and then simply copy the disk to this directory. Then make similar directories for later issues.*

The first two issues of COMPUTE!'s PC Magazine—dated September 1987 and November 1987—included a disk menu program. If you copy the contents of both of these disks into the same directory on the hard drive, you can't use the menu program to run the programs. The menu program on each disk is custom-tailored for that disk alone. It calls special files containing program names and descriptions which are different on each disk. If you copy several versions of the menu program into the same directory, the last menu files you copy will be the only version in the directory. It won't run programs from different issues.

The disk menu program in past issues was included as a convenience; it was never required to run the programs on the disks. But because it confused some readers and also took up too much disk space, it has been eliminated with this issue. Instead, descriptions for the files on the magazine disk can be found in a README file. For more details, see "How to Use the Disk" elsewhere in this issue.

Redirecting DEBUG

I am interested in assembly language, and I wonder why none of the assemblers like DEBUG can create a disk file that contains a disassembly or memory display. Is there a reason for this, or is there a way to make such a disk file?

Doug Ludig

DEBUG has commands that can make disk files, and you can also use the same commands to send a disassembly or a memory dump to a printer. The secret is to use the DOS redirection symbols > and <. Here's how.

On the DOS command line, type:

DEBUG ***targetfile > listfile***

The DOS output redirection command (>) sends DEBUG's output to the filename specified by listfile *instead of to the screen.*

One difficulty is that once DEBUG is loaded after entering this command, any following commands you enter can't be seen on the screen because they, too, are sent to the disk file. You have to enter your DEBUG commands without seeing a response.

For example, let's suppose you want a $100-byte-long dissassembly beginning at 3EA8:0100. After DEBUG loads, you'll see a blank screen. Blindly enter the DEBUG command U3EA8:0100 L100 *and press Enter/Return. DEBUG sends the listing to* listfile. *Since the screen remains blank throughout this process, the only way you'll know DEBUG has finished writing the file is to wait until the drive stops running. Then type* Q *to quit DEBUG.*

To see if you have the listing you want, use the TYPE command or a text editor to view the output disk file. If you made any typing errors in the commands you entered blindly, you'll find an error message here.

If you dislike typing blind, there's a way to avoid it. You can redirect DEBUG's input with the DOS input redirection command (<) in the same way you redirect its output. The input is another disk file containing your DEBUG commands. You can prepare it with a text editor or a word processor before running DEBUG. Be sure the last line of your input file contains the Q command that quits DEBUG. (If you don't include the Q command, DEBUG will wait forever for a command it can never receive.) Then enter the following on the DOS command line:

DEBUG ***targetfile < inputfile > listfile***

You can use the redirection symbol (>) to send output to a printer, too. At the DOS prompt, type DEBUG > LPT1. *In this case, any commands you enter are echoed on the printer, so it's not quite as disconcerting as sending output to a disk file. Here, too, you can use redirected input to send commands to DEBUG, as shown in the previous example.*

If you think this is all a bit crude, you're right. Assemblers like DEBUG date back to the earlier days of computing, when computers didn't have enough memory to contain code for all of the user-friendly accouterment we take for granted in today's software. **PC**

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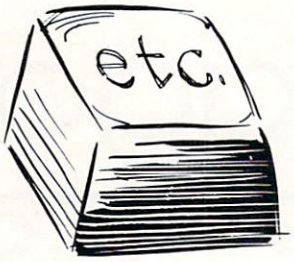


Everyone Should Have Keyboard Macros

Because keyboard macro programs are among the most powerful utilities now available—and among my personal favorites—they need a much more detailed explanation than I had room for in last issue's column on utility software.

A keyboard macro program allows you to assign a series of keystrokes (called a *macro*) to any key or two-key sequence on your computer. When you press the key or key combination that activates the macro, the macro enters the assigned series of keystrokes just as if you had typed them yourself on the keyboard. The series of keystrokes may consist of as many as several hundred numbers, words, phrases, or commands. Frequently used phrases and difficult-to-remember commands can be encoded in macros to make your computer much easier to use. You can establish semipermanent macros that remain available from one day to the next, and you can add new macros whenever you need them.

A typical keyboard macro program allows you to keep dozens of macros active in memory at a time. You can store additional sets of macros in disk files and bring them into memory as needed. These files are generally stored in standard ASCII format, so if the editor built into the macro program falls short of your needs, you can use almost any word processor to more easily create and modify your keystroke sequences.

Most of today's keyboard macro packages offer additional capabilities. For example, some provide an automatic operation mode that makes it possible for a program to run itself via preestablished keyboard macros. This feature is invaluable for setting up sales or training demonstrations. Others offer file encryption capabilities. Many packages provide simplified access to DOS commands from within application software. With this feature, you can erase, copy, or rename files; remove and make subdirectories; change paths; and even run one application program from within another. Some of these utilities also give you the ability to establish pull-down menus that control application software via user-designed keyboard macros.

Whether you're a "power user" or a casual hobbyist, a good keyboard macro program can be an invaluable operating tool.

Generic Macros

One of the most important uses of keyboard macro software is to speed up and simplify your control over the computer. You do this by creating keyboard macros that reduce frequent operations to single-key or two-key commands.

A common approach is to use the keyboard macro program to build a set of pull-down menus that offer the most frequent command options for rapid and automatic execution. This is particularly helpful in three situations: where the application program normally requires many keystrokes for each command; where you use the application so rarely that you tend to forget some of its more useful command sequences; and where other users, perhaps less knowledgeable than you, need help to get the most from a particular application.

In addition to these three situations, keyboard macros can be helpful in the most frequent activities you perform with your various applications.

For example, a common action when working with almost any application is to save the current file from time to time as you continue working with it. *WordStar* requires a sequence of six keystrokes to save a text file and return you to your place in the document. *Reflex* (a powerful relational database) requires five keystrokes. *Lotus 1-2-3* demands quite a few keystrokes for this, as do many other popular applications. With a keyboard macro program, however, you can assign all of the required keystrokes to a single function key or Alt-function key combination.

Another useful but frequently repeated action is to add the current date to a note field in a record. Some applications offer commands to accomplish this, but many do not. Some keyboard macro programs recognize this need and offer built-in date and time stamps. But even if the keyboard macro software you choose does not have this feature, you can write the date into a keyboard macro once each day, and then have it added to your note fields automatically.

Those who frequently work with subdirectories will appreciate

Robert A. Moskowitz

the ease and convenience of copying files from one location to another by means of keyboard macros. Some macro programs provide simplified copy commands, picking up the filenames and paths directly from disk so you don't have to type them in. But any macro program allows you to build a system for entering a path and/or filename just once and using it several times automatically as you issue copy commands.

Another very useful task macros can simplify is the repetitive changes you probably make to your data files. For example, you may want to add quotation marks around each line of an address file to make it more compatible with mail-merge operations. Or you may want to move zip codes to separate lines in the file. Or when converting data files for use with a new application, you often need to add or subtract hard carriage returns at the end of each line and between paragraphs, change parentheses to brackets, and so forth. Making dozens or hundreds of these changes manually is time-consuming and prone to error. Doing it once as a keyboard macro, though—and then letting the computer repeat the process throughout the file—is more elegant as well as more efficient.

Macros For Word Processors

Word processors create opportunities for other, more specialized keyboard macros you can use in addition to some or all of the generic ones described above.

For example, with a single keyboard macro that works with all types of correspondence, you can make the inside address in a letter or memo print as the outside address on an envelope (assuming your printer can handle envelopes, of course).

Other macros simplify the use of your word processor's commands, making it possible to block words, phrases, lines, sentences, paragraphs, and other logical text units with a single keystroke. You can apply the same principle to create macros that control start/stop toggles, such as those for underlining, boldface, italics, and other special functions. The macro toggles the function on and waits until you press another key, usually Return/Enter, to toggle it back off.

You can also invent macros to undo frequently repeated mistakes. For example, I often find myself typing letters in reverse order, such as *ytpe* instead of *type*. So I created a simple two-key macro that uses the word processor's block functions to transpose letters for me automatically. Macros can even eliminate errors before they occur. For instance, whenever you encounter a long or difficult-to-type word or acronym—such as *Wollongong* or *TCP/IP*—you can immediately capture it as a macro and never have to type it in that file again.

You can use keyboard macros for very elaborate functions, too. *WordStar*, for example, lets you insert invisible markers in a document to which you can instantly jump later. I've written macros that bring previously marked sentences to a new location which may be far away from the old one, and then automatically reformat the text.

Other Applications

By now, you're probably beginning to see how flexible and useful a keyboard macro utility can become. A few more examples will demonstrate the broad range of capabilities.

Some database programs are extremely simple and powerful, but have sacrificed some of the amenities so much appreciated by mainframe users. For example, when entering large volumes of data, it's nice to be able to repeat the same entry found in the corresponding field of the previous record. Zip codes, area codes, dates, and other entries are often repeated across many records. Keyboard macros make this simple, either by automatically capturing each field's entry for quick copying to the next record, or by creating menus with the most popular entries for copying any where you want to.

Macros are also useful for scooting around rapidly within a record or among many records in a database. Instead of repeatedly pressing the next-field or next-record key, you can just set up a macro to automatically trigger the key for you the required number of times.

In spreadsheets, complicated macro capabilities built into the applications can be supplanted with simpler, more powerful keyboard macros. Built correctly, they can automate your movement around the spreadsheet and speed and simplify your entry of data and formulas. At least one product available for the PC—which uses a sophisticated and automatic macro selection system based on the values in specified screen locations—even lets you attach explanatory notes to entries in critical cells.

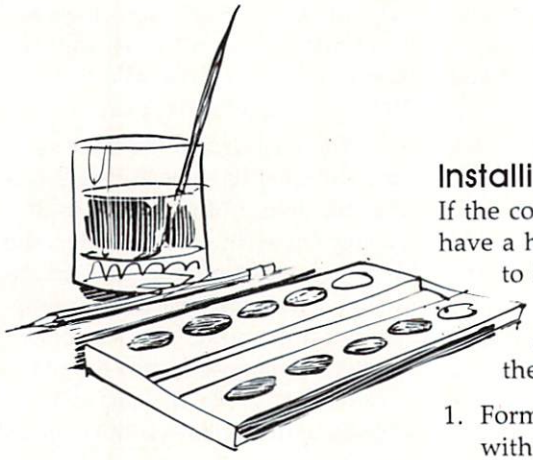
Although macro utilities are relatively inexpensive, they are among the most powerful and flexible additions you can make to your computer system. They can reduce repetitive keystrokes by more than 90 percent, thereby saving time, eliminating errors, and reducing the drudgery of manipulating complex applications.

As a general guide, you should consider converting any three-key or longer sequence you use more than twice a day into a keyboard macro. You'll be amazed by the difference this makes in your ability to accomplish work with your computer.

(Note: In my previous column's discussion of unerase utilities, I forgot to mention that there are new programs that can recover data even after a disk has been reformatted. Until now, a reformatted disk was pretty much a hopeless case.)

Robert A. Moskowitz is a business consultant based in Woodland Hills, California. His background includes numerous articles published in a variety of national magazines, and he is the developer of the computerized Personal Productivity Audit. Mail can be addressed to him in care of COMPUTE!'s PC Magazine, P.O. Box 5406, Greensboro, NC 27403. **PC**

BEST OF THE BOARDS



PC-ART

"Best of the Boards" features outstanding programs gathered from bulletin board systems throughout the country. Some of the programs are in the public domain; some are copyrighted "shareware" programs (freely distributed in return for voluntary donations). In each case, COMPUTE!'s PC Magazine obtains the program directly from the original author in return for a publication fee. We then test the program, rework the documentation, and present the polished package here.

This issue's featured program is PC-ART *by Mike Stone. It's a full-featured and easy-to-use drawing program that requires neither a mouse nor a joystick. It runs on any IBM PC, PCjr, XT, AT, or compatible with at least 256K RAM; DOS 2.0 or higher; a color/graphics adapter (CGA), enhanced graphics adapter (EGA), or equivalent hardware; and a color monitor. An IBM Graphics Printer or Epson-compatible dot-matrix printer is optional.*

Until now, the search for an easy-to-use drawing program for your PC has probably been futile. Commercial drawing programs are expensive and most require a mouse or a joystick. But your search may be over.

"Best of the Boards" presents the outstanding *PC-ART* in this issue. Written in Microsoft's *QuickBASIC* by Mike Stone, *PC-ART* is a full-featured drawing program that operates entirely from the keyboard. Among many other things, it offers a freehand drawing option with five line widths, a paint brush that can paint in 15 patterns, line and box functions, two text fonts in ten sizes, automatic circle drawing, four line patterns, instant selection of four drawing colors, and 16 background colors.

You can save or retrieve screens with the touch of a key, or save a portion of the screen in an image library for later use. A snapshot function lets you save part of a screen image, placing it in different locations on the screen with a single keystroke. You can print any artwork you create with *PC-ART* on a compatible dot-matrix printer.

PC-ART uses pop-up icon-based menu panels for function selections. Once you make a selection, the panel disappears, leaving your artwork undisturbed.

To run *PC-ART*, you need an IBM PC, PCjr, XT, AT, or compatible with at least 256K of random access memory (RAM), DOS 2.0 or later, a color/graphics adapter (CGA) or enhanced graphics adapter (EGA), and a color monitor. Some compatibles have the equivalent of a CGA card built into their hardware; check your computer manual to be sure. An IBM Graphics Printer or Epson-compatible dot-matrix printer is optional.

Program By Mike Stone
Column By George Campbell

Installing *PC-ART*

If the computer you're using doesn't have a hard disk drive, you need to find a blank floppy and create a system disk for *PC-ART*. To do this, follow these steps:

1. Format the blank floppy disk with the /S option of the FORMAT command (FORMAT /S). This puts DOS files on the disk to make it self-booting.
2. Copy the following files from the magazine disk onto your freshly formatted *PC-ART* disk: PCART.EXE, PC-ART.IMG, and DEMO.PIC.
3. If you have a compatible printer and want to make hardcopies of your creations, copy the file GRAPHICS.COM or GRAPHICS .EXE from your DOS disk onto the *PC-ART* disk.

If the system you're using has a hard disk drive, create a new directory for the *PC-ART* files. We recommend naming the new directory \ART. Copy the files listed above into this directory.

Using *PC-ART*

Before starting *PC-ART*, decide whether you'll want to print hardcopies of your artwork. If you do, enter this command at the DOS prompt:

```
GRAPHICS
```

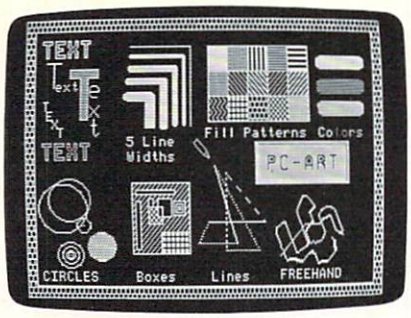
This loads the DOS utility for sending screen dumps to the printer.

Next, to run *PC-ART*, enter this command at the DOS prompt:

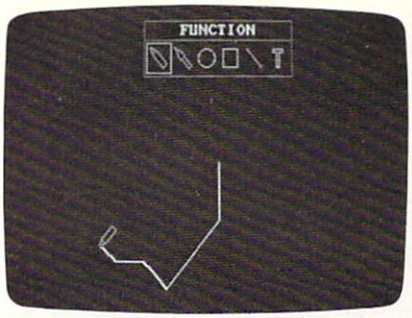
```
PCART
```

On hard disk systems, change to the \ART directory before starting the program.

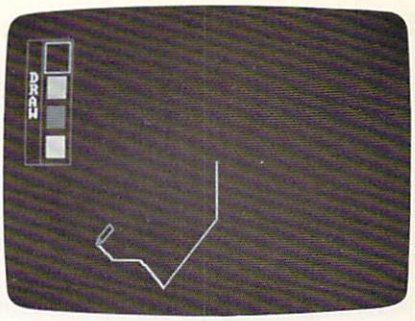
Once *PC-ART* loads itself into memory, you'll see a blank screen with a crayon in the center. At this point, you're ready to begin creating original artwork.



The magazine disk includes this sample screen under the filename DEMO.PIC.



F1 calls up the mode menu, where you can select the crayon, paintbrush, circle, box, line, or text modes.



Press F3 to display the color-selection panel. The four colors available depend on the palette selected.

Selecting A Drawing Mode

Press the F1 function key, and a menu panel pops up at the top of your screen. A set of icons allows you to choose the crayon, paintbrush, circle, box, line, or text modes. Use the left and right cursor keys to position the moving box over the icon of your choice and then press F10 to return to the drawing screen.

All menu panels operate the same way. Use a cursor key to select an option and then press F10 to return to the drawing screen. Some menu panels appear at the sides of the screen. For these panels, use the up and down cursor keys to make selections.

Now let's look at the drawing modes, one at a time.

Crayon Mode

This is the default drawing mode, which allows you to draw freehand. The icon representing this mode is the outline of a crayon. You can raise or lower this crayon to stop or start drawing. Press the U key to raise the crayon and move it without drawing a line, or press the D key to lower it and start drawing.

Control the movement of the crayon with the cursor keys; they move the crayon one pixel (screen dot) in the direction of the arrow. The Home, Pg Up, End, and Pg Dn keys move the crayon diagonally. If you hold down the Ctrl key while pressing one of the diagonal-movement keys, the crayon moves to one of the corners of the screen.

You can change the speed of the crayon by pressing one of the number keys on the top row of the keyboard. The 1 key is the default and allows the crayon to move one pixel at a time. The 5 key moves the crayon five pixels at a time, and so forth up to 0, which moves ten pixels at a time.

Vary the crayon's line width with a combination of the Alt key plus a number key. Alt-1 sets the crayon to draw a line one pixel wide, while Alt-5, the maximum, sets a five-pixel line width.

To set the line's color, press the F3 function key. This opens the color-selection panel. Choose one of the four colors with the up and down cursor keys; then press F10 to return to your drawing. This color choice remains in effect until changed.

To alter the background color, press the F8 key. Each time you press the key, the color changes, cycling through all 16 possible colors.

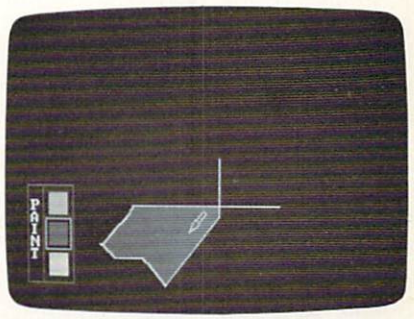
Two color palettes are available. Press the F9 key to alternate between them. As before, the palette you select becomes the default, and all colors on the screen change to reflect the new palette.

Paintbrush Mode

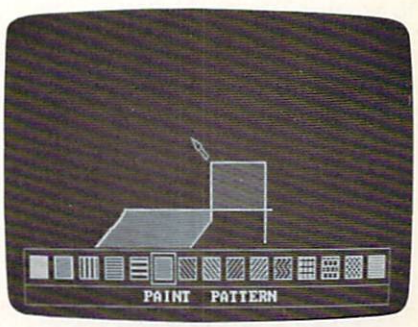
This mode, the second selection in the F1 menu, fills enclosed areas with color. When you choose paintbrush mode, a paintbrush icon replaces the crayon on the screen.

Move the paintbrush with the cursor keys, just as you do the crayon. The speed selections also work in this mode.

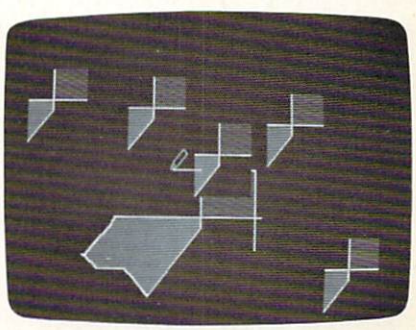
Choose a paint pattern by pressing the F7 key. A menu ap-



To select a fill color for the paintbrush, press F5.



Fifteen different fill patterns are available from this menu when you press F7.



PC-ART *lets you take a "snapshot" of a portion of the screen and paste it back down anywhere you want.*

pears at the bottom of your screen, allowing you to choose from 15 patterns. Use the cursor keys to select a pattern and then press F10 to return to the drawing.

You can also select a color for the paint function. Press the F5 key to pop up the paint-color selection window. Choose a color and then press F10 to return. The paint color can be different from the drawing color.

Now move the paintbrush icon to the area to be painted. All painting begins at the very tip of the brush. To fill an area with the paint pattern, press the P key. The pattern flows from the tip of the brush and spreads until it contacts the enclosing line.

Use the paintbrush with caution. If you try to paint an area that is not completely enclosed with the current drawing color from the F3 menu, the pattern will fill the entire screen. Also, if the figure you want to paint was drawn with anything but a solid line, the fill pattern can leak out.

Similarly, if a space is outlined in a color other than the one currently in effect, the paint pattern doesn't recognize the border and fills the entire screen.

Running In Circles

The third choice in the F1 mode menu allows you to quickly and easily draw circles on the screen. The menu represents this mode with a small circle.

When you select circle mode, the crayon appears at the center of the screen. Crayon speed choices remain in effect, and can be changed as described above. Point the crayon to the desired center point of the circle and press the P key.

Now, using the cursor keys, move the crayon to the desired outer edge of your circle. When you press the C key, *PC-ART* draws the circle in the current drawing color. Of course, you can change drawing colors before making the circle, if you wish.

You can draw additional concentric circles by moving the crayon and pressing C again. To indicate the center point of a new circle, relocate the crayon and mark the center by pressing P again.

Drawing Boxes

When you select box mode—represented by a small box on the F1 mode menu—you can draw boxes at any location on the screen. The crayon appears on the screen when you enter box mode.

Position the crayon to indicate the upper left corner of the desired box. Press the P key to mark this spot. Now move the crayon to indicate the lower right corner of the box. Press the B key to draw the box in the current drawing color.

You can select four line patterns in box mode. Press F6 to open the line pattern menu and then select a pattern. As always, F10 returns you to the drawing.

As in circle mode, the point you select with the P key remains in effect as the upper left corner until you change it. This allows you to draw several boxes with the same corner. To select a new corner, move the crayon and press the P key again.

Drawing Lines

The line-drawing mode is represented by a short diagonal line in the F1 mode menu. Choose this mode to draw lines in the current drawing color between any two points on the screen.

When you press F10 to return to the drawing, move the crayon to the beginning point of your line. Press P to mark the point and then move to the end of the line. Press L to draw the line.

After you draw a line, the next beginning point transfers to the end of the last line, allowing you to draw from point to point easily. Just move the crayon and press L to draw the next segment. To select another beginning point, move the crayon and press P.

You can select any of the line patterns from the F6 menu, changing patterns with each segment if you wish. You can also draw lines in any color from the F3 menu.

Using Text Mode

The last selection in the mode menu, represented by the letter *T*, allows you to place text anywhere on the screen.

PC-ART offers two text fonts: a solid font and an outline font. Choose between the two by pressing F4. Select a font from the menu that appears and then press F10 to return to the drawing. If you like, you can fill in the outlined font letters with a pattern using the paintbrush.

Each font is available in ten sizes. Select a size by holding down the Alt key while pressing a number key. Alt-1 selects the smallest font size, while Alt-0 selects the largest size.

Point the crayon to where you want the center of the letter to appear; then type the letter of your choice. Following letters are spaced appropriately.

Normal text-editing keys, such as Ins, Del, and Backspace, don't work in this mode. Also, while in text mode, the crayon moves only one pixel at a time.

Erasing Mistakes

If you make a mistake with *PC-ART*, you can correct it in several ways. Each method is used for different purposes.

The first method is very simple to use. Just repeat your mistake, but use the background color. For example, if you just made a box in box mode, press the F3 key, select the background color from the color menu, and draw an identical box in the same position. Because your new box appears in the background color, it effectively erases the old box. This method works in all modes.

As an alternative, choose crayon mode from the F1 mode menu. Once again, open the F3 menu to choose the background color. By choosing various widths for the crayon, you can move the crayon around like an eraser, removing old lines.

Finally, *PC-ART* offers a method for removing entire areas from the screen. Hold down the Alt key

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and press F8. Now, move the crayon to the upper left corner of the area to be erased. Press F10 and then move the crayon to the lower right corner of the desired area. Press F10 again. Anything within this imaginary box will disappear.

If you want to clear the entire screen, just press the Alt-F7 combination. *PC-ART* asks you to confirm this action. Press Y to clear the screen, or press N to abort the function.

Taking Snapshots

PC-ART allows you to save a section of the screen as a snapshot at any time. To do this, press the Alt-F4 combination. Move the crayon to the upper left corner of the desired area and press F10. Move the crayon to the lower right corner and press F10 once more. *PC-ART* stores the selected area in memory.

To paste the snapshot back on the screen, press Alt-F3, then move the crayon to indicate the upper left corner of the area where the snapshot should appear. When you press F10, the image appears on the screen. You can repeat this operation as often as you wish.

The Image Library

PC-ART also allows you to store sections of screens in a permanent image library on disk. This library is contained in a file called PC-ART.IMG. The sample library file on the magazine disk contains only one image, a star. But you can add your own images to the library as you choose.

To store an image, take a snapshot of it as described above. Then press Alt-F6. *PC-ART* prompts you to assign a name to the image; enter eight characters or less. When you press Enter/Return, *PC-ART* stores the image on disk in the current directory.

To retrieve an image from the library, press Alt-F5. *PC-ART* clears the screen and displays a list of images stored in the library file. Select the image you want to load. When you press Enter/Return, your screen reappears undisturbed.

PC-ART Command Summary

Key	Action
F1	Pops up the mode menu.
F3	Pops up the drawing-color menu.
F4	Pops up the text-font menu.
F5	Pops up the paint-color menu.
F6	Pops up the line-pattern menu.
F7	Pops up the paint-pattern menu.
F8	Changes background color.
F9	Changes the color palette.
F10	Returns to screen from any menu or marks areas for snapshots or erasing.
Alt-F1	Loads a screen from disk.
Alt-F2	Saves a screen on disk.
Alt-F3	Pastes a stored snapshot on screen.
Alt-F4	Takes snapshot of area.
Alt-F5	Loads an image from image library.
Alt-F6	Stores an image in image library.
Alt-F7	Erases screen.
Alt-F8	Erases portion of screen.
1–0	Change speed of drawing tool.
Alt-1 to Alt-0	Change sizes of text characters.
Alt-1 to Alt-5	Change width of crayon line.
P	Marks a point onscreen or paints in paintbrush mode.
C	Draws a circle.
B	Draws a box.
L	Draws a line.
Cursor keys	Position drawing tool on screen.
Home, End PgUp, PgDn	Move drawing tool diagonally.
Ctrl-Home, Ctrl-End, Ctrl-PgUp, Ctrl-PgDn	Move drawing tool to corners of screen.

Now position the crayon at the upper left corner of the area where you want the image to appear and press F10. The retrieved image is pasted down like a regular snapshot. You can paste down the image any number of times by using the snapshot commands.

Saving And Retrieving Pictures

You can, of course, save and load entire *PC-ART* screens as well as snapshots. To save a screen, press Alt-F2. When *PC-ART* prompts you for a filename, enter up to eight characters but do not include an extension; *PC-ART* automatically appends the extension .PIC.

By default, *PC-ART* always stores picture files in the current drive and directory. If you want to store a file on another disk, include the drive name, like this:

```
B:FILENAME
```

However, this limits you to six characters for the filename.

To load a *PC-ART* screen, press Alt-F1. When you enter the desired filename at the prompt and press Enter/Return, *PC-ART* loads and displays the new screen. The existing screen is replaced with the new one, so be sure to save your work before loading a picture.

The magazine disk includes one sample picture file, DEMO.PIC. It can be loaded as described above.

It's a good idea to save screens frequently, especially before making a major change to an important picture. That way, if you make a huge mistake, you can simply reload the screen as it was before. This is particularly handy when using the paintbrush function, since a tiny leak can result in the entire screen being painted.

PC-ART stores screens in BASIC BSAVE format. Each screen uses 16K of disk space, so be careful not to overload a floppy disk with files.

If you program in BASIC or

Microsoft *QuickBASIC*, you can even include *PC-ART* screens in your own programs. This is an ideal way to create elaborate title screens or game backgrounds. To demonstrate this technique, we've written a short BASIC routine that displays a *PC-ART* screen from within any BASIC program. The file is named PICSHOW.BAS on the magazine disk. You can include this routine in your own programs, modifying it to suit your needs. PICSHOW.BAS runs in BASICA, GW-BASIC, and *QuickBASIC*. The sample program on the magazine disk displays the screen in DEMO.PIC.

Printing *PC-ART* Images

You can print *PC-ART* screens on any IBM Graphics Printer or Epson-compatible dot-matrix printer. Remember, though, that you must load the DOS utility GRAPHICS .COM or GRAPHICS.EXE *before* running *PC-ART*. (Review the installation instructions at the beginning of this column.)

Be sure your printer is online and loaded with paper before printing. When you're ready to print a screen, hold down the Shift key and press the PrtSc key.

PC-ART prints the picture exactly as it appears on the screen, each picture taking about half a sheet of paper. Since the crayon or any other icons will print as well, hide the icon inside a filled area on the screen before printing.

Exiting *PC-ART*

When you're finished using *PC-ART*, simply press the Esc key to return to DOS. Be careful with this command, however; *PC-ART* exits immediately without requesting confirmation, so be sure to save your work before pressing Esc. This abrupt exit is another good reason to save your work frequently.

A Note About Shareware

Like many of the programs presented in "Best of the Boards," *PC-ART* is a *shareware* program which is supported by its users. The author requests a voluntary donation which goes entirely to the author, not to COMPUTE!'s PC Magazine.

If you use *PC-ART* regularly, you may choose to honor the author's shareware request and become a registered user. If so, the author promises to send you a new version of the program which was much too large to fit on our magazine disk. To register, send $25 to Mike Stone, 201 Heyden Dr., Eureka, MO 63025. Be sure to mention COMPUTE!'s PC Magazine when you register. **PC**

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EZDOS

W.C. Chambers, Jr.

This versatile program does almost everything DOS should do, but doesn't. It provides more than 50 new commands and enhancements to make your computer more efficient and easier to use—everything from a friendly command-line editor to special backup commands for business people and programmers. There are even some hard drive housekeeping functions you won't find in software specifically designed for that purpose. Written entirely in machine language for high speed and compactness, "EZDOS" runs on any IBM PC, PCjr, XT, AT, or compatible with at least 256K of memory and DOS 2.0 or higher; printer optional. It has also been successfully tested on the IBM 3270-PC, 3270-PC/G, and GX; IBM PS/2 Models 30, 50, 60, and 80; and on multitasking systems.

DOS has made a lot of progress since it first appeared six years ago, but it still leaves a lot to be desired. The command-line editing is clumsy, important labor-saving commands are missing, and its floppy-oriented ancestry can be a pain when working with today's 20-megabyte and larger hard disk drives.

We can't just get rid of DOS, of course. DOS stands for Disk Operating System, and our systems wouldn't be very operable without it. But we can improve it.

That's the idea behind "EZDOS"—to make life with DOS easier. Whether you've got a genuine IBM PC, PCjr, XT, AT, or PS/2 with PC-DOS, or an IBM compatible with MS-DOS, you'll find EZDOS a worthwhile addition.

For example, take the DOS command-line editor. When you make a typing error, ordinarily you have to backspace all the way to the mistake or reenter the whole line. With EZDOS, you can use the cursor, Backspace, Delete, and Insert keys to edit the DOS command line just as you'd edit a sentence with a word processor. If you're tired of endlessly typing the colons and asterisks that DOS requires, EZDOS will help. If you think there should be an easier way to get a directory listing for drive B than typing DIR B:, EZDOS agrees.

With EZDOS, you can define the function keys to type anything for you with a single keystroke. Instead of typing the same commands over and over again, you can call upon EZDOS's history feature to instantly recall commands you've already entered. When you display a directory listing, you can find out how much disk space the files use without running CHKDSK—and with only two keystrokes.

If the computer system you use is equipped with a hard disk, you'll love EZDOS's disk-management features. For example, you can remove every redundant COMMAND.COM file from every directory, or you can move all of your BASIC or .DOC files into one directory. You can back up all of the files on your hard drive in a snap—and you won't have to buy an expensive tape machine to do it.

Business people can rely on EZDOS to make their daily or monthly backups, and programmers can quickly back up a day's work on a floppy in case things go wrong.

There's much more. EZDOS makes it easy to move files from one directory to another in a single step or to check time/date stamps before copying a file. With a REPEAT command, you can execute COPY, DELete, or any other command throughout every hard drive directory and subdirectory—without entering the CD command even once. Batch files can offer menus of programs and automatically run the user's choice.

Anyone from novice to expert will find EZDOS a boon. You'll be surprised how much easier complex tasks become. To top it off, EZDOS has built-in help screens *and* a help file with a summary of commands.

EZDOS Requirements

EZDOS works on any IBM PC, PCjr, XT, AT or compatible with at least 256K of random access memory (RAM) and DOS 2.0 or higher. It runs on both color and monochrome systems. EZDOS has also been successfully tested on the following systems: IBM 3270-PC, 3270-PC/G, and GX and the new IBM PS/2 Models 30, 50, 60, and 80 with DOS 2.0 or higher. A printer is is useful but optional. EZDOS is well behaved on multitasking systems, except for the DSTAT, SCROLL, and color selection commands. (DSTAT works if it's run before the multitasking supervisor begins.)

EZDOS doesn't replace DOS; it supplements it. Therefore, EZDOS must always be able to find DOS in order to operate. If you have a floppy drive system, or if you boot a hard drive system from a floppy, be sure there's a floppy disk in drive A with the file COMMAND.COM. If you boot the computer from a

hard drive, COMMAND.COM will be in the root directory of the hard disk and accessible to EZDOS. (COMMAND.COM is the portion of DOS not stored in the computer's memory; see the FORMAT command in your DOS manual for more details about preparing a floppy disk with COMMAND.COM.)

If you use a ramdisk (a section of memory set aside to emulate a disk drive), you can copy COMMAND.COM to the ramdisk and achieve better performance when using EZDOS. First, copy COMMAND.COM to the ramdisk. Then, at the DOS prompt, issue this command:

```
SET COMSPEC=X:COMMAND.COM
```

where *X* is your ramdisk drive identifier.

This tells DOS to look for COMMAND.COM on the ramdisk, allowing EZDOS to link to external commands without any drive activity. This speeds up the EZDOS commands. If you want, you can set up your AUTOEXEC.BAT file to perform these steps for you automatically each time you boot up. (See "Getting Started with Batch Files," COMPUTE!'s PC Magazine, November 1987.)

While EZDOS is active, do not attempt to install any memory-resident programs (these are also known as *TSR,* or *terminate-and-stay-resident,* programs). Programs that fall into the memory-resident category are popular commercial packages such as *Sidekick,* as well as "Keyboard Lock-Out" in this issue and DOS's own PRINT, GRAPHICS, and MODE utilities. You *can* use memory-resident programs with EZDOS; you just can't *install* them while using EZDOS.

In other words, you must either install the memory-resident programs *before* activating EZDOS (keep this in mind if you load EZDOS in your AUTOEXEC .BAT file), or else you must temporarily exit EZDOS, install the memory resident programs, and then reenter EZDOS. The reason for this is that EZDOS uses memory above the program code for its data and can overwrite any programs resident there.

Starting EZDOS

EZDOS is found on the magazine disk with the filename EZ.COM. Notice how relatively small it is (about 26K) in comparison to its capabilities; the program is written completely in machine language for maximum speed and minimum size.

As with all programs on the magazine disk, we recommend making a backup copy and then using the backup. Put EZ.COM on a floppy in drive A or on the root directory of your hard disk. Thanks to its compact size, it may well fit on your DOS disk.

The magazine disk also contains a file called EZHELP.DOC. This is a help file that contains a summary of EZDOS commands. This file is summoned by the EZDOS HELP command, and it must be copied to the same disk as EZDOS. It must also be copied into any subdirectories in which you want the help file to be available. (This is due to a limitation of DOS; it won't search for a .DOC file beyond the current directory.) If EZDOS looks for the EZHELP.DOC file and can't find it, you'll receive a *File not found* error message. If you don't think you'll need the help file, we'll describe later how to use the HELPOFF command to tell EZDOS not to look for it.

You can run EZDOS from the magazine menu program or directly from DOS. To run it from DOS, simply enter EZ at the command prompt. When EZDOS is loaded, you'll see a copyright notice and a new line at the bottom of the screen. This line shows the commands that the function keys F1–F10 will print on the screen when you press them. You'll also see a modified DOS prompt. The EZDOS prompt displays the current subdirectory (if any) and the system time.

EZDOS allows you to load multiple copies of itself at once; you can type EZ on the EZDOS command line and load another copy of EZDOS into memory. However, this wastes memory and also may cause EZDOS to behave in odd ways. If you think you might have loaded EZDOS more than once, enter the QUIT command. If the EZDOS prompt remains on the screen, you had more than one copy in memory. Keep entering the QUIT command until the standard DOS prompt returns; then reload EZDOS just once.

Command-Line Editor

EZDOS has a flexible command-line editor that makes entering commands as easy as typing with a word processor. If you make a typo, you can move the cursor along the command line with the left- and right-arrow keys and enter your correction. The Backspace key, as usual, erases the character to the left of the cursor. The Delete key erases the character under the cursor, and the Insert key allows you to enter new characters at the cursor location. You'll see the cursor change shape when you enter Insert mode.

The Home key moves the cursor to the start of the command line, while the End key moves it to the end. You can delete all characters from the cursor position to the end of the command line by pressing Ctrl-End (hold down the Ctrl key and press End).

For your convenience, EZDOS keeps a record of the previous 16 commands you entered. You can view any of these by pressing the up-arrow or down-arrow key. The up-arrow key scrolls backward through the commands, while the down-arrow key scrolls forward. As each command is displayed, you can execute it by pressing Enter/Return, edit it as described above, or remove it altogether by pressing the Esc key.

Save Your Fingers

EZDOS also saves you time by allowing you to avoid typing those endless shifted colons and asterisks required by DOS. Consider this DOS command:

```
COPY A:*.* B:*.TXT
```

Notice it contains five shifted characters (* and :).

With EZDOS to help, the same line can be typed like this:

```
COPY A;-.- B;-.TXT
```

This contains no shifted characters. EZDOS automatically translates semicolons into colons and minus signs into asterisks. This makes one-finger typing a near reality.

Occasionally, you may need to enter a semicolon or minus sign on the command line that shouldn't be translated. So EZDOS lets you defeat this feature by appending the */A* switch to the command. The translation stops automatically, anyway, if a comma is encountered on the command line. Any characters to the right of a comma generally contain data which shouldn't be changed.

Defining Function Keys

EZDOS lets you define the function keys to automatically type any command you want on the screen. This eliminates the need to retype repetitive commands. You can define function keys F1–F10, and also the Shift-Function and Ctrl-Function key combinations. If you include a carriage return at the end of a function definition, the function key can type and execute a command with just one keypress.

The keys F1–F10 are defined with the F*n* command (where *n* is the key number). For example, to define key F1 to print a directory listing for all the files on drive B, enter

```
F1 'DIR B:'
```

and press Enter/Return. Notice how the definition is enclosed between single quotation marks.

If you want to include a carriage return in the definition so it will execute with a single keypress, add a caret symbol (^), which represents a carriage return. Put it at the end of the command, just before the final single quotation mark. The caret is Shift-6 on most PC-compatible keyboards.

EZDOS stores the function-key definitions in the program itself. Moreover, when you define a function key, EZDOS automatically writes a new copy of itself on the default drive to preserve the new key definitions. This way, you can use the function keys without reentering the definitions each time you load EZDOS. If you want, you can keep a different version of EZDOS in each directory, with the function keys defined for the task you regularly perform there.

Keys F11–F20 (Shifted F1–F10) are defined with the SF (Shift-Function) command, not F*n*. Otherwise, the definition syntax is the same. If you need more function-key sequences, you can define the Ctrl–function key combinations with the CF command. Note, however, that you can define only Ctrl-F1 through Ctrl-F6. The higher keys aren't usable.

Unlike the F*n* command, the SF and CF commands don't write a new version of EZDOS to disk to preserve the key definitions. If you want to save the Shift and Ctrl definitions, use the WRITEZ command; simply enter WRITEZ on the EZDOS command line. This writes a new version of EZDOS with the new definitions to the default disk drive.

Function-Key Tips

The F*n* command allows function-key definitions only ten characters long for F1–F10. The SF and CF commands allow definitions as long as 20 characters. There is, however, a way to define much longer strings using SF and CF. To do this, you must first install the ANSI.SYS device driver that came with your DOS disk. (See your DOS manual for details.) Then you must notify EZDOS that it's installed by issuing the ANSI command; simply type ANSI on the EZDOS command line and press Enter/Return. Finally, press the K key and Enter/Return to send the function-key information to ANSI.SYS. This procedure allows function-key definitions up to the length of the ANSI.SYS buffer (about 200 characters) and even lets you include more than one carriage-return character (^) in a definition.

Another advantage of this procedure is that function-key definitions (including the Shift–function key and Ctrl–function key definitions) remain in effect even if you end EZDOS with the QUIT or EXIT commands. You can use the function keys you defined with EZDOS at the regular DOS command line or even while running another program. This can make it easier to enter repetitive data.

Note that some programs (the BASIC interpreter is one of them) disable ANSI.SYS key definitions; any key definitions you've entered earlier are ignored. You can find out if a program disables ANSI.SYS-defined keys just by loading the program and trying it.

If you run another program from EZDOS without QUITing or EXITing EZDOS, the Shift- and Ctrl-function keys remain defined. But the unshifted function keys (F1–F10) are turned off. This prevents interference with any unshifted function-key definitions set by the program you're running.

To remind yourself of the new key definitions while in EZDOS—or to display any other message—you can customize the status line at the bottom of the EZDOS screen. Simply enter L25 (for screen line 25) and enter your own line when prompted. An easy way to include function-key definitions in this line is to enter a number representing the function key and then press the function key itself to enter its data in the display. However, don't use this method with commands in which you've inserted a carriage return, since the command will be executed as soon as you press the key.

Command Overview

EZDOS adds many new commands to make your time on the computer less frustrating. It also enhances

standard DOS commands. The enhanced commands (COPY, RENname, and DELete) have the same names as the DOS commands, but they work somewhat differently. The new commands as well as the enhancements are explained in more detail in "EZDOS Command Summary" accompanying this article. You should refer to this summary often while you're learning EZDOS.

If EZDOS can't execute a command for some reason, it passes the command along to DOS for execution. For example, the EZDOS COPY command does not allow a path as part of a filename. If you enter

```
COPY MYFILE.* C:\BASIC
```

at the EZDOS command line, EZDOS can't carry it out, because it contains the pathname \BASIC. But EZDOS doesn't just reject the command and make you type it over. Instead, it passes the command to DOS, which executes it normally.

If you want to explicitly send a command to DOS without leaving EZDOS, precede the command with an X (for eXecute):

```
X COPY CON MYFILE.BAT
```

EZDOS immediately passes the command to DOS for normal execution.

Like many DOS commands, EZDOS commands allow you to append one or more *switches* to activate certain options. Think of a switch as a minicommand which can be added to the end of a main command to modify its action in some way. A switch consists of a forward slash character (/) immediately followed by another character which defines the switch. The slash should be separated from the main command by a space. This is how switches work with DOS commands, too, so the arrangement should be familiar.

Here's an example of a switch appended to an EZDOS command:

```
COPY MYFILE.* C: /Q
```

The switch is /Q, which stands for *query*. In this case, it modifies the COPY command by telling EZDOS to query you (request confirmation) before copying each file. Otherwise, EZDOS would copy all of the files defined by MYFILE.* without requesting confirmation. EZDOS has many switches, and some can be used in combination with others. All of the possible EZDOS switches are covered in more detail in the section entitled "EZDOS Switches."

Observe one caution when using switches: You can use EZDOS switches with EZDOS commands, and DOS switches with DOS commands, but you can't use an EZDOS switch with a regular DOS command or vice versa. Sometimes this happens by accident when you enter an EZDOS command that is passed along to DOS because EZDOS can't carry it out. Consider this example:

```
COPY MYFILE.* C:\BASIC /Q
```

Remember, the EZDOS COPY command doesn't allow paths such as \BASIC, so EZDOS would pass this command along to DOS for execution. But DOS wouldn't recognize the /Q EZDOS switch and would respond with an *Invalid Parameter* error message.

If you run DOS 3.0 or higher, there's a way to use pathnames in EZDOS commands which disallow them. You can use the DOS SUBST command to substitute a drive letter for the subdirectory. Since DOS versions below version 3.0 don't have the SUBST command, you must keep the pathname restriction in mind when using earlier versions of DOS. (See the section on using the SUBST command with EZDOS later in this article.)

EZ Disk Directories

Calling up a disk directory is one of the most common functions performed with DOS. If we each had a dime for every time we typed DIR, we'd probably be millionaires by now. That's why EZDOS provides a streamlined way to display disk directories.

Usually you can enter a directory command with only one or two keys. For instance, if you want to display the directory of default drive A, just enter D to see an uncompressed listing, or F to see a compressed listing. (In an uncompressed listing, EZDOS arranges the filenames in two columns and shows the date/time stamps and file sizes; in a compressed listing, EZDOS arranges the filenames in four columns and omits the date/time stamps.) To see the directory of drive B, enter FB or DB; for drive C, enter FC or DC; and so on.

The D and F commands both display directories with the filenames sorted alphabetically. The files can also be sorted by date or size if the the /D or /S switches are added at the end of the command. Examples:

```
D  /S  (uncompressed listing sorted by size)
F  /D  (compressed listing sorted by date)
```

If you don't want any sorting done, use the /O switch.

Both the D and F commands show the amount of disk space used by the files and how much disk space remains free. This makes it easy to find out if the files you want to copy to another disk will fit. If you use the NAME command (see below) to add additional identifying text to the disk, it's included in the directory listing as well.

More New Commands

Another common function performed with DOS is making backups—either copying individual files to another disk or copying an entire disk to a backup disk. EZDOS provides a special command to make this much easier.

Let's say you've been working all day with an application program on drive B. Now it's 5 p.m., and you want to back up your work before leaving for the

day. Simply enter this command:

```
LOG A:
```

EZDOS copies all of files in the current drive or directory which have been created or changed today onto the disk in drive A.

Of course, you can use LOG to make backups on any drive; see the "EZDOS Command Summary" for more details. The summary also provides tips for making backups with hard disks.

Another shortcut command in EZDOS is MOVE. This performs in one step what DOS requires two commands to do: It first copies a file to another disk or directory and then deletes the original file. Normally, DOS would require you to issue separate COPY and DELete commands for this purpose.

Perhaps the most powerful new EZDOS command is REPEAT. This command causes the command following it to be carried out in the current directory and *every subdirectory* within the directory. As we'll see later, this is especially valuable on systems with hard drives.

The SETCODE command makes it possible to write batch files containing menus. The batch file can display a menu with numbered items and then call EZDOS. EZDOS prompts you for the selection, sets the ERRORLEVEL code returned to DOS with the value of the number you entered, and then exits. This allows you to make a batch file that displays a menu, accepts input, and then executes the selected function. See the SETCODE entry in the command summary for more details.

The REMOVE command makes it easy to clean up a hard disk cluttered with redundant files. It removes all files from a drive or directory which have the same name in another drive or directory. Combined with the enhanced COPY command, REMOVE also makes it easier to back up a hard disk.

The T command types a text file on the screen, just like the DOS TYPE command. But unlike TYPE, T accepts wildcard characters to save you repetitive keystrokes.

Be sure to review the command summary while experimenting with EZDOS commands. It contains the command syntax as well as the list of compatible switches.

Enhanced Commands

Some EZDOS commands perform functions similar to DOS programs which must be loaded from the DOS disk. For example, to reset the screen mode, normally you must run the DOS MODE program. But the EZDOS CO80 and BW80 commands do much the same thing. The same is true of the EZDOS HIDE and UNHIDE commands, which reset the hidden-file attribute. (MS-DOS has a program called CHMOD to do this, but PC-DOS doesn't have the program at all.) Like the DOS TREE program, the EZDOS MAPDISK command lists the directory structure of a hard drive. The advantage of the EZDOS commands is that they can be executed without forcing you to locate the DOS disk.

Many EZDOS commands can send output to a printer instead of to the screen. Just add the /P (for Print) switch to the end of the command. This makes getting a hardcopy a snap.

If you use the /Q (query) switch, many EZDOS commands will prompt you for confirmation before the command is carried out. This permits safer deletion of files, for example.

There are some special features of the enhanced EZDOS commands COPY, RENname, and DELete. When you delete or rename files, the name of each file is displayed in turn. You can watch the effect of the command, and you have time to recover from a mistake.

The /D (for Date) switch tells the COPY command to replace a file on the target disk only if the source file has a more recent creation date. By combining the /D switch with the /B (for Backup) switch, it's easy to copy a file to a disk only if it updates an older copy of the same file.

If you copy a file that shows 1980 in the date field, EZDOS assumes the system clock was not set when the file was created. It corrects this by stamping the file with the current date and time.

EZDOS Business Backups

The COPY command with the added power of the EZDOS /T switch can make monthly and quarterly backups a breeze. You can use this combination to specify a certain date (the first day of the month, for example). Then, at the end of the month, you can copy all files used in the course of the month to another drive. Here's how.

The /T switch ordinarily tells EZDOS to use today's files only, but if you enter it another way, it has a different meaning. If you enter it in the form

```
/T=mm-dd-yy
```

(*mm-dd-yy* means month, day, and year), the COPY command with the extended /T switch copies all files having dates the same as or later than the date you enter. For example, the command

```
COPY *.* A: /T=01-01-85
```

copies all files dated on or later than January 1, 1985 from the current directory to drive A. When you use the /T switch extended in this way, EZDOS won't copy files dated earlier than the date you specify.

EZDOS makes it easy to back up files for any period you wish. You can make quarterly backups, for instance. At the end of each quarter, enter the date of the first day in the quarter in the /T switch. Then use the COPY command to copy all files used this quarter to another disk.

You can tailor the backup to your needs by appending more EZDOS switches to the COPY com-

mand. For example, if you add the /B (for Backup) switch to the command, files are copied only when the same filename already exists on the backup disk. If you add the /P switch, files are copied to the same directory on the backup disk, and so on.

The following example backs up only .DBF files in the \DBASE subdirectory. It also copies only .DBF files changed on or after April 1, 1987:

```
C:
CD \DBASE
COPY *.DBF A: /B/S/T=04-01-87
```

Since the /B switch is added, EZDOS copies a .DBF file only if an earlier version already exists on drive A. Since the /S (Segment) switch is added, EZDOS divides any file which is too long to fit on the drive A disk into parts which can be put on more than one disk. For more details on switch operations, see "EZDOS Switches" included with this article.

When you design backup commands to suit your needs, put them into a batch file. That way, you don't have to retype the commands each time you use them.

Notice that each part of a date entry must contain two digits. If the date entry has only one digit, precede it with a zero. For example, /T=1-1-85 is incorrect; T=01-01-85 is the correct way to enter the date.

Pathnames And The DOS SUBST Command

While you can use pathnames in some EZDOS commands (MOVE, for example), you can't use them in others, such as COPY, DELete, RENAME, REMOVE, T, and P. (Pathnames are the same as directory names and are indicated by a backslash [\] entered before a name.)

If you run DOS 3.1 or higher, however, there's a way you can use pathnames in the EZDOS commands which disallow them. The newer versions of DOS contain a command called SUBST (for SUBSTitute). You can use this command to substitute a drive letter for a pathname.

Here's an example. Suppose you want to copy some, but not all, of the programs in the C:\DOS directory to drive A. The COPY command plus the EZDOS /Q (for Query) switch is ideal for the purpose, because it prompts you before it copies each file. This way you can copy only the files that you want to copy and skip the rest. Suppose you enter

```
COPY C:\DOS\*.* A: /Q
```

EZDOS sends the command to DOS for execution. When DOS reads the /Q switch, it issues an error message.

If you use the SUBST command to substitute drive E for the \DOS directory, however, EZDOS executes the command.

```
SUBST E: C:\DOS
COPY E:*.* A: /Q
SUBST E: /D
```

These commands accomplish what you intend, but provoke no error message from DOS or EZDOS. Note that drive E doesn't actually exist in the same way that drive A does. It's a drive letter only, not a drive. The SUBST command temporarily makes the \DOS directory drive E. (The final command in this series simply undefines the drive letter *E*.)

Here's another example. Suppose you want to use the REMOVE command to delete all of the files in drive A which are duplicated in a directory called \PGMS on drive C. Suppose you enter

```
REMOVE C:\PGMS\*.* A:
```

When EZDOS finds the pathname in the command, it issues an error message. To execute the command without errors, use SUBST to substitute drive E for the directory \PGMS. If you enter

```
SUBST E: C:\PGMS
REMOVE E:*.* A:
SUBST E: /D
```

the REMOVE command does what you want it to. As in the earlier example, the final command returns drive E to normal.

See your DOS manual for more information on the SUBST command, and also see the DOS LASTDRIVE command for information on the specification of drive letters. When you use the SUBST command, be sure that DOS can find a file called SUBST.EXE. This file must be in the current directory, or else you must specify a path to its location.

Customizing EZDOS

Some features of EZDOS—such as function-key definitions, the ANSI and HELPON/OFF settings, the prompt, and the line-25 display—can be made a permanent part of the version of EZDOS on the default drive or directory. This allows you to customize a version of EZDOS so that the next time you run it, you don't have to modify it again. Simply enter the WRITEZ command to write a new version of EZDOS to the default drive. If you define an unShifted function key with the F*n* command, a new version of EZDOS is automatically written to disk with the current settings.

You can also customize EZDOS to suit your tastes when loading it from DOS. Enter this command at the DOS prompt:

```
EZ < EZDATA
```

EZDOS loads and then reads the disk file EZDATA. This configuration file may contain any EZDOS commands. It's a convienient way to quickly define function keys, the EZDOS prompt, and so on, without entering everything at the EZDOS command line. You can use any word processor or text editor that is capable of saving plain ASCII text files to create an EZDATA file. (Actually, you can use any filename for the configuration file; just substitute it for EZDATA in the example above.)

Below is an example of an EZDOS configuration file. Notice that it includes the WRITEZ command to write a version of EZDOS containing the current set-

tings on the disk. When the following file is executed, the key definitions and prompt on line 25 will be as specified in the file.

```
F1 'A:'
F2 'B:'
F3 'FA'
CF1 'REPEAT'
SF1 'COPY'
ANSI
L25
1-A: 2-B: 3-FA CF1-REPEAT SF1-COPY
WRITEZ
QUIT
```

Important: An EZDOS configuration file *must* end with the QUIT command. Otherwise, the computer will lock up.

A sample EZDOS configuration file is included on the magazine disk under the filename EZDATA. You can modify this file for your own needs.

Hard Drive Management

As mentioned above, the REPEAT command is invaluable for hard drive housekeeping. It also works with floppy drives, of course, but is more useful with hard drives because of their complex directory structures. Think of REPEAT as a sort of "super command" that works across directory boundaries. It executes the command following it in the current directory and all of the directory's subdirectories. If the current directory is the root directory, the command following REPEAT is executed throughout every directory on the drive.

Here's an example. COMMAND.COM—the file for PC-DOS or MS-DOS—is often present on floppy disks that are copied to a hard drive. Before long, the hard drive is cluttered with redundant copies of COMMAND.COM in nearly every directory. To delete all of them with one blow, first make sure a copy of COMMAND.COM is safely located on another drive and that a COMSPEC command is issued to inform DOS of its location. (There are instructions for placing COMMAND.COM on a ramdisk earlier in this article.) Then load EZDOS and enter the following commands, assuming the hard drive is installed as drive C:

```
C:
CD \
REPEAT DEL COMMAND.COM /Q
```

REPEAT moves through every directory on the hard drive and executes the DELete command. Since the /Q switch is appended, EZDOS queries you before deleting each copy of COMMAND.COM.

When all of the bothersome COMMAND.COMs have been deleted, be sure to move one copy of COMMAND.COM back into the root directory of the hard disk from its safe haven on another drive. (You can't boot the computer from the hard drive without it.)

Here's another example. With the following commands, you can quickly move all BASIC programs on the hard drive—no matter where they are—to a directory called \BASIC:

```
C:
CD \
MD \BASIC
REPEAT MOVE *.BAS C:\BASIC /Q
```

Again, this assumes the hard disk is installed as drive C and that a directory named \BASIC doesn't already exist. REPEAT goes through all directories on drive C and moves every file with the .BAS extention to the newly created \BASIC directory. You can similarly move all .DOC files to one directory, and so on.

Note that the command following REPEAT can be either an EZDOS command or a regular DOS command. If it's an EZDOS command such as MOVE in the example above, any switches which can be used with the command are honored. If it's a DOS command, EZDOS passes it along to DOS for execution.

Backing Up Hard Drives

Backing up and restoring a hard disk is much easier with EZDOS than with regular DOS. Using EZDOS commands, you can make quick backups of a hard disk daily by copying only those files which have changed during the course of the day. They can then be easily restored, if necessary.

To quickly back up a day's work, you can run a batch file called BYE.BAT at the end of the day:

```
C:
CD \
EZ REPEAT LOG B: /E/P/D
```

This loads EZDOS, identifies all the files that were changed today on drive C, and backs them up on drive B. Often it takes only a minute to run. If you fill the disk in drive B, EZDOS asks you to insert a new disk. Then it continues to copy.

If you've completely backed up a hard disk on floppies, it's easy to completely restore the hard disk with EZDOS. To do this, you need a batch file such as the one below, which we'll call UPDATE.BAT. This batch file copies all of the files from the floppy backup disks to their original subdirectories on the hard drive:

```
B:
REPEAT COPY B:*.* C: /P/D
C:
```

If you've filled several floppies with BYE.BAT, it will be necessary to repeat this batch file for each of them.

This leaves only one problem. If you've deleted any files from the hard drive since the last backup, they're still present on the backup disks. When you run UPDATE.BAT, EZDOS puts them back on the hard drive where you don't want them. The solution is to let the REMOVE command get rid of the unwanted files from the hard drive after UPDATE.BAT has been run.

Here's how. Before you delete a file from the hard drive, use the COPY command with the /P switch to copy the file to the same directory on a floppy disk. Use a special floppy kept for this purpose.

This example assumes the floppy is in drive A:

COPY *filename.ext* **A: /P**

The special floppy will then have a copy of every program you've deleted from the hard drive.

Now, after you've run UPDATE.BAT, put the special floppy in drive A and run a batch file called CLEANUP.BAT which contains the following commands:

```
A:
EZ REPEAT REMOVE A:*.* C: /E/P
C:
```

This removes all files from the hard drive that are found on the special floppy in drive A.

EZDOS Switches

Switches are like "minicommands" which can modify the operation of an EZDOS command in some way. Each consists of one letter preceded by a forward slash (/). There must be a space between the main command and the first switch, but no spaces are needed between following switches. Any number of switches can be combined following a command, but note that some switches have contrary effects and shouldn't be combined.

/A As explained in the main article, EZDOS normally translates all semicolons (;) to colons (:) and minus signs (−) to asterisks (*) for easier typing. The /A switch stops this translation. Sometimes you need to enter a semicolon or minus sign on the command line, and you can't if EZDOS is translating them into another character.

/B Backup mode. The EZDOS COPY command copies a file only if the same filename already exists on the target disk.

/C Clears the screen before displaying any output.

/D The date or directory switch. It has the following effects when used with the following commands:

COPY: Copies a file from one disk to another only when the file on the source disk is newer than the file on the target disk. This applies only to files with the same name on both the source and target disks, and takes into account only the date stamp, not the time stamp.

F or D: The disk directory is sorted by the date stamp.

RENAME: EZDOS renames subdirectories contained in the current directory instead of renaming files.

/E End EZDOS after this command. You must always append this switch to EZDOS commands in batch files. Otherwise, you find yourself at the EZDOS command line, and subsequent lines in the batch file are not executed until you exit EZDOS. Exception: The EZDOS SETCODE command does not require /E.

/F Form-feed switch. Send a form feed to the printer after this command.

/H Hidden switch. It has the following effects when used with the following commands:

F or D: Include hidden files in directory listings.

COPY: Hidden files are copied and marked as hidden files on the target disk. Notice that the EZDOS COPY command (unlike DOS COPY) can copy hidden files if this switch is used. If the /W switch is specified, the hidden files are erased from the target disk before the copy starts.

DELETE: Delete hidden files as well as normal files.

/L Low-memory switch. It forces DSTAT to use RAM below 640K for disk status monitoring. This is necessary only if you have RAM in segments D and E that has not been initialized before the DSTAT command is executed or if you're using some expanded memory cards. This avoids parity check 2 errors or EMS conflicts.

/N The new switch; it's the reverse of the /B backup switch. The source file is copied only if there is *not* a copy already on the target disk.

/P The printer switch. Output is sent to LPT1 instead of to the video display. This is useful for making hard copies of directory listings. Do not confuse with the other /P switch below.

/P When used with COPY or LOG, this /P switch forces the files to be copied into the same directory on the target drive where they were found on the source drive. If this directory does not exist, it is created. This is a good way to restore files without having to keep track of what directory the files belong in.

/Q The query switch. It asks for confirmation before proceeding with each step of the command at hand. For example, if you have a lot of files with the .BAS extension on a disk, you can enter *COPY *.BAS B:*.* /Q*. One by one, EZDOS displays each filename and prompts *COPY Yes/No/Cancel?* This allows you to selectively copy the files without remembering and entering each filename. The /Q switch also works with the RENAME and DELETE commands.

/R The remark switch. It prompts the user for a REMARK line to be included in the directory listing. This is useful when printing directory listings.

/S The segment switch. When backing up files from high-capacity devices like hard drives or high-density floppies, the /S switch allows the COPY command to segment a file across multiple target disks. This allows you to completely fill the target disk and back up very large source files. You must remember to reconstruct the original file later by recombining the file segments into a single file.

/T The today switch. It forces the command to use files altered or created *today* only. Be sure the system

date and time are correct if you plan to use this switch. To COPY, RENAME, MOVE, or DELETE files that were made or changed today, add the /T option to the command. For example, the command *COPY C:*.BAS A: /T* copies all .BAS files that were altered today from drive C to drive A. This makes it easy to keep current backup copies of your data files without copying them individually.

The /T switch has an additional function with the COPY, DELETE, and RENAME commands. If the command is entered in the form /T=*mm-dd-yy* (for month-day-year), only files with dates the same or later than the specified date are copied, deleted, or renamed. When specifying the date, you must use leading zeros with single digits (if any). For example, enter /T=01-01-85 instead of /T=1-1-85.

/W The wipeout switch. Use it with the COPY command to delete all files from the target disk before any files are copied. This is useful when backing up a hard disk subdirectory on floppies when all the files won't fit on a single disk. Without the /W option, you would first have to erase all files from all of the disks before beginning the copy operation. If /H is also specified, all hidden files are erased, including DOS, if present.

/X Exclude the file-count message after a COPY, RENAME, MOVE, or DELETE. This makes BAT files run with no visible messages when you turn ECHO OFF. Also tells EZDOS directory routines not to pause when the screen is full.

EZDOS Command Summary

A summary of EZDOS commands follows. Some commands have a short form which is shown with uppercase letters. To execute an EZDOS command, you can enter either the short form or the entire commmand.

Optional parts of an EZDOS command are surrounded by square brackets ([ ]). Do not type the brackets. The part of an entry which must be supplied by the user (a filename, for example) is shown in *italics.*

The optional switches which can be appended to each command are also listed here. Each begins with a forward slash (/) and is followed by a single letter. There must be a space between the main command and the first switch, but subsequent switches may be combined without spaces between them. While any of the switches listed may be used with a command, they can't all be used together; note that some perform contrary tasks. For a complete explanation of EZDOS switches, see the accompanying section, "EZDOS Switches."

[NO]ANSI /C/E

This command tells EZDOS whether or not the ANSI .SYS device driver is installed in the computer. (See your DOS manual for more information on ANSI .SYS.) If you issue the ANSI command to notify EZDOS that ANSI.SYS is installed, you can use the K command to send the current function-key definitions to ANSI.SYS. Then, when you leave EZDOS with the QUIT or EXIT command, the function keys remain defined as they were when EZDOS was active. This way, the function-key definitions may be used when running another program.

To tell EZDOS that ANSI.SYS is *not* installed, enter the command NOANSI. That way, EZDOS won't attempt to pass function-key definitions to the nonexistent device driver. Otherwise, you'll see garbage characters on the screen.

Without ANSI.SYS installed, definitions for the Shift–function keys and Ctrl–function keys are limited to 20 characters each. With ANSI.SYS installed, the Shift– and Ctrl–function key strings are limited only by the ANSI.SYS buffer size (about 200 characters) and may contain several carriage-return characters. (Note that the ANSI.SYS buffer size is the limit for *all* of the function-key definitions put together, not the limit for each individual definition.) ANSI.SYS will feed the keystrokes to the currently running program as they are requested.

Any EZDOS command (such as F*n* or WRITEZ) that writes a new copy of EZDOS to disk also saves the ANSI settings, so you don't have to enter these changes every time you run EZDOS. You can use the STATUS command (see below) to check if EZDOS knows that ANSI.SYS is installed.

BEEP /C/E

This command merely sounds the speaker. You can use it in batch files to alert the user that some operation is required or has finished.

BLACK /C/E
BLUE /C/E
GREEN /C/E
RED /C/E

These four commands set the background and border colors on a color monitor. Text appears in white. EZDOS automatically returns you to DOS after any of these commands are entered; you can reload EZDOS if you wish, and the colors remain. If you issue any of these commands again—assuming the computer hasn't been rebooted—EZDOS doesn't return you to DOS.

BOOT

This handy command reboots the system. A power-on self-test (POST) is performed, and a complete cold-start is triggered. If the computer has an extended-memory XMA card, it is reset. This command is designed to work on all IBM-compatible computers; if you have an IBM, see the REBOOT command.

BW40 /C/E
BW80 /C/E

The BW40 command adjusts the system to the 40-column monochrome (black-and-white) mode; BW80 adjusts to the 80-column monochrome mode. Both commands are more convenient than the DOS MODE command, which must be loaded from the DOS disk in order to function. Unlike MODE, however, it won't switch from color to monochrome when both types of monitors are attached to the computer.

BYE /C/E

This command parks the heads of a hard disk drive. EZDOS consults the disk parameter table to find the disk landing zone and then seeks that cylinder. This is safer than assuming the last cylinder is the landing zone. (If you change your mind after the heads are parked, press the Return key three times to restart the system.)

CF*n 'definition'* /A/C/E

As described earlier, the CF command defines the Ctrl–function key combinations. Only Ctrl-F1 through Ctrl-F6 can be defined with the CF command; the other Ctrl–function key combinations are inaccessible. Substitute the number of the function key (1–6) for *n*. Substitute your function-key definition for *definition;* be sure to surround it with single quotation marks. Example:

CF1 'DB^'

This defines Ctrl-F1 to display an uncompressed disk directory of drive B when pressed. Note the carriage-return character (^).

To make the assignment permanent, use the WRITEZ command.

If the ANSI.SYS device driver is not installed in the computer, the CF definition is limited to 20 characters. Longer strings can be defined when ANSI.SYS is installed and EZDOS has been notified of that fact with the ANSI command. See above entry for the ANSI command.

CO40 /C/E
CO80 /C/E

These commands are the counterparts to the BW40 and BW80 commands described above. They adjust the system for either the 40- or 80-column color modes without using the DOS MODE command. They are more convenient than using MODE, which must be loaded from the DOS disk in order to function. Some application programs (such as *Lotus 1-2-3*) end in monochrome mode; CO40 and CO80 provide an easy way to return to color mode.

COpy [*x*:]*source_filename*[*.ext*] [*x*:][*target_filename*][*.ext*] /A/B/C/D/E/H/N/P/Q/S/T/W/X

EZDOS's COPY command is similar to the regular DOS COPY, but has some important differences and enhancements. Its basic function, of course, is to copy a source file to a target file. Substitute the appropriate drive identifiers for *x*:, the filename and optional extension of the file you want to copy for *source_filename.ext*, and the optional new filename and optional extension for *target_filename.ext*.

Unlike the DOS COPY command, the EZDOS COPY command does not allow a pathname. If you include a pathname, EZDOS passes the command along to DOS for regular processing. However, this will result in an error message if you've appended any of the EZDOS switches.

Following is an explanation of some of the switches. See the accompanying section, "EZDOS Switches," for more information.

/B The file is copied only if that filename already exists on the target disk.

/D Similar to /B. The file is copied only if that filename already exists on the target disk, *and* if the existing file is older than the file being copied.

/N The reverse of /B. The file is copied only if that filename *doesn't* exist on the target disk.

/P Files are copied from the current subdirectory into a subdirectory with the same name on the target drive. If the subdirectory doesn't exist on the target disk, EZDOS creates it. This switch makes it easier to back up and restore hard disks, since you don't need to keep track of which files belong in what directories. Note that the /P switch doesn't make a new directory for subdirectories within the current subdirectory, nor does it copy files from within the sub-subdirectory.

/Q EZDOS queries the user with *Yes/No/Cancel* before each file is copied. If there isn't enough room left on the target disk to copy a file, EZDOS lets you know. You can then either change the disk (or the drive) to copy the file. If you don't make the change, EZDOS skips the file that doesn't fit on the target disk and tries to copy the next file; some of the files remaining to be copied may be small enough to fit the available space.

/S Allows one source file to be put on several target disks if the source file is too long to fit on one disk. EZDOS copies the portion of the file that fits on the target disk and then prompts you to insert a new target disk to hold the remainder. Before using a file divided in this manner, you must remember to recombine the segments.

/T Only those files which contain today's system date and time are copied. If the command is entered in the form /T=*mm-dd-yy* (where *mm-dd-yy* is a month-day-year), only files with dates the same as or later than the specified date are copied. Note: You must enter the date with leading zeros before single digits. Example: /T=01-02-86, not /T=1-2-86.

/W All files are deleted from the target disk before the first file is copied. EZDOS displays a warning first as a safety measure. If /H is also used, the hidden files are removed as well as the regular files. This can be used to remove DOS from a disk you're using for data storage only.

Many people are accustomed to using the DOS COPY command to create short batch files by copying console input to a disk file—such as COPY CON *filename.bat*. If you try this with EZDOS, the operation terminates the first time you press Enter/Return. To get around this, bypass EZDOS by using the X command, as in X COPY CON *filename.bat*. This temporarily passes control to DOS for the COPY.

D [*x*:][*filename*][.*ext*] /A/C/D/E/F/H/P/R/S/T/O

This short command displays a directory for drive *x*: with filenames sorted in alphabetical order. The drive identifier can be combined with the command to speed typing. For example, DA gives the directory listing for drive A, DB for drive B, and so on. To selectively display certain files in the directory, substitute the appropriate characters for *filename.ext*. For instance, the command *DB *.DOC* displays all the files on drive B ending with the extension .DOC.

The /D switch sorts by date; /S sorts by file size; /O switches off sorting altogether (like DOS).

Unlike the DOS DIR command, D cannot be used to display a directory listing for a directory outside the current directory. Use the DOS DIR command to read outside directories.

The D directory list contains the disk's volume label (if one was assigned when the disk was formatted), the path, drive, and the disk name (see NAME command). Each file is accompanied by the file size and date/time stamp indicating when the file was created. The disk space used by the selected files is shown, along with the free space left on the disk. The directory display automatically pauses and waits for a keystroke if it won't fit on the screen. If you don't want the display to pause, use the /X switch.

DELete [*x*:]*filename*[.*ext*] /A/C/E/Q/T

Like the DOS DEL command, this command deletes the specified file. The optional switches, however, make it more versatile. Also, it displays the filenames as they're deleted. Unlike the DOS command, though, it cannot accept a path in the filename. If a pathname is indicated by the presence of a backslash (\ ), the command is passed to DOS for execution and the EZDOS switches won't be recognized.

With the /T switch, only those files which match the system date are deleted. With the /Q switch, EZDOS prompts you before deleting each file.

DPARM /C/E

This command adjusts the timing parameters for floppy disk drives to allow faster and quieter operation. It should be used only on an IBM PC or XT but not on a PCjr, PC AT, or compatible. If you're using DRIVER .SYS to support 3½-inch drives, do not use DPARM.

[NO]DRIVE /C/E

The DRIVE command includes the default-drive letter in the EZDOS command-line prompt; NODRIVE excludes the drive identifier from the prompt.

DSTAT /C/E/L

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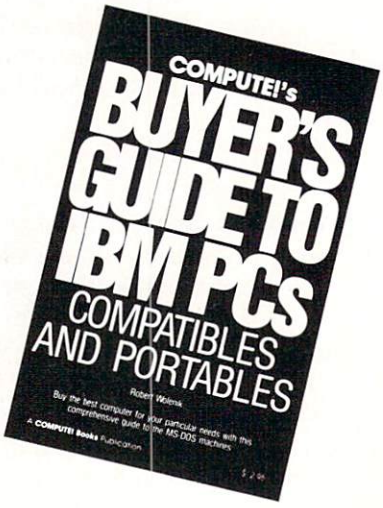

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This installs a resident extension to DOS that handles disk input/output. If any disk errors occur, you'll see a message in the upper right corner of the screen which shows a summary of disk activity, including the track and sector of the last disk error. DSTAT is a memory-resident (TSR) function, so installing it causes EZDOS to terminate. Simply run EZDOS again.

When DSTAT is installed, details of any disk I/O errors can be reviewed with the STATUS command.

DUMP [*x*:][*path* \]*filename*[*.ext*] /A/C/E/F/P

This displays the contents of the selected file in both hexadecimal (base 16) numbers and ASCII (plain text) in blocks of 128 bytes. The last block is padded with zeros to make it easier to find the end of the file. Use the /P (Print) switch to send the listing to your printer. No wildcard characters may be used.

EXIT /C

This command ends EZDOS and returns to normal DOS. There is another use for EXIT besides leaving EZDOS. If you want to install a memory-resident (TSR) program, you must EXIT to DOS, install the program, and then rerun EZDOS. Memory-resident programs cannot be *installed* from within EZDOS, but they can be *active* while using EZDOS. A synonym for EXIT is QUIT.

F [*x*:][*filename*][*.ext*] /A/C/D/E/F/H/O/P/R/S/T/X

This command displays an abbreviated directory list, sorted alphabetically. The drive identifier can be combined with the command to speed up typing. FA gives the directory listing for drive A, FB for drive B, and so on. Unlike the D command, the list produced by F is compressed. It displays the filenames in four columns, along with the disk name and label (if any), the path, the file sizes, the disk space used by the selected files, and the free space on the disk.

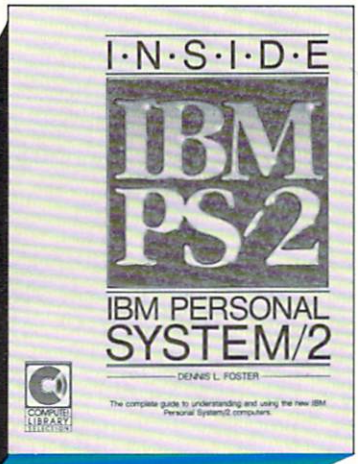
If you use the /S switch, the list is sorted by file size; /D sorts the list by date; /O displays an unsorted list, like DOS. The screen display pauses and waits for a keystroke when the screen is full. If you don't want the display to pause, use the /X switch.

Unlike the DOS DIR command, F cannot be used to get a directory listing for a directory outside the current directory. Use the DOS DIR command to read outside directories.

F*n* '*definition*' /A/C/E

As described earlier, the F*n* command defines the function keys F1–F10. Substitute the number of the function key for *n*; substitute your own definition for *definition*. Remember to enclose it in single quotation marks. To append a carriage-return character to a definition (this makes the function key execute with a single keypress), type the caret character (^).

Defining a function key with F*n* automatically saves a new copy of EZDOS in the current directory with the filename EZ.COM. This makes it possible to have different versions of EZDOS on different disks or in different directories with function keys defined ap-



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propriately to a specific task.

Because the definitions are stored in the program, the string length of a definition is limited to ten characters. If you want to use longer strings, define the Shift–function key and Ctrl–function key combinations. (See the SF and CF commands.)

The key definitions for F1–F10 are shut off when you run an application program from EZDOS. This is done to prevent interference with the application program's own function-key definitions. The Shift–function key and Ctrl–function key definitions are not shut off, however, when ANSI.SYS is installed. This allows you to define these keys for use in an application program. (See the ANSI command.)

If the F*n* command is sometimes reluctant to accept a definition, it may be because the ANSI.SYS device driver is installed and you have not notified EZDOS of this fact with the ANSI command. Use the STATUS command to find out if the copy of EZDOS you're using knows that ANSI.SYS is installed.

Help /C/E/H/P/X

This command displays the EZDOS help screens (note that you can type H or HELP). If there is a file named EZHELP.DOC in the current directory, it is displayed or printed (see HELPON below). The help file can be the EZDOS help file or a help file for some other program—simply rename your alternate help file EZHELP .DOC. The /H switch displays an extra screen that contains commands used less often.

HELPON /C
HELPOFF /C

HELPON (the default status) tells EZDOS to display the file EZHELP.DOC after displaying the internal help screens. Be sure EZHELP.DOC is in the current directory or drive, or you'll receive an error message. HELPOFF disables this action, but you'll still get the internal help screens. After changing this setting, you may use WRITEZ to preserve the selection.

HIDE [*x*:]*filename*[.*ext*] /C/E

This hides the specified file or subdirectory. Hidden files don't show in a directory listing, and the DOS COPY command can't copy them. Use UNHIDE to make the file or subdirectory visible again.

IDON *text*
IDOFF

These commands affect the EZDOS command-line prompt. IDON *text* allows you to define up to 24 characters in the prompt to add identifying text or comments. For instance, the command IDON WINDOW=A adds the text WINDOW=A to the prompt. IDOFF removes the text from the prompt.

K /C/E

This command turns on the function-key settings for keys F1–F10 and displays the line-25 text (as defined by the L25 command). If ANSI.SYS is installed and you've notified EZDOS of that fact with the ANSI command, the stored key strings are passed as well. That way, if you exit from EZDOS with the EXIT or QUIT commands, the function keys remain defined.

If you run an application program from EZDOS, however, the un-Shifted function keys F1–F10 are returned to normal. This keeps them from interfering with the application program's own function-key definitions. The Shift–function key and Ctrl–function key combinations remain defined.

L25 /A/C/E

This command prompts you to enter a new message which is displayed in reverse video on line 25 (the bottom line) of the screen. Just enter the text as you want it to appear. If you want a space to appear in normal video, enter a tilde (~). You can use this line to display function-key reminders and so on.

When you use the L25 command, EZDOS automatically saves a new version of itself in the default directory under the filename EZ.COM. The new line 25 then appears whenever you load this version.

An easy way to define a function-key reminder line is to type a number representing the function key and then press the function key itself to display its string. Don't use this method, however, if the key definition includes a carriage return (indicated by a caret ^). Otherwise, the function key is executed.

The reminder line is limited to 80 characters. Since the EZDOS program calls a standard DOS function to display the line, you can't use a dollar sign ($) in the text. (The dollar sign is the character DOS uses to recognize the end of a line.)

Label *x*:[*volumelabel*] /A/E

With this command you can display the volume label (if any) for the drive specified by *x*:, or specify a new *volumelabel* of up to 11 characters. The label shows up in directory listings. Note that the abbreviated form of this command is *L*.

LOG [*x*:] /C/E/P/Q

The LOG command copies all files created or changed today to the drive specified by *x*:. It is equivalent to the EZDOS command COPY *.* [*x*:] /D/T. LOG copies today's files only once, so subsequent changes in today's files made today won't be sent to the specified disk. If you don't specify a drive, EZDOS copies the files to the drive you specified in the previous LOG command. If you never specified a drive, EZDOS copies the files to drive A. If you change the target drive with LOG and want to make the change permanent, use the WRITEZ command to save a new copy of EZDOS on disk. You can find out which drive is the default LOG drive with the STATUS command.

If the target drive has a subdirectory with the same name as the current subdirectory on the source drive, EZDOS copies the files to that subdirectory. For instance, suppose you're working in the ASMDISK directory on drive C, and you type LOG D. If there is a directory called ASMDISK on drive D, EZDOS copies the files changed today into D:\ASMDISK. Otherwise, EZDOS copies them into the current directory

on D.

The /P switch tells EZDOS to create a subdirectory on the target drive with the same name as the current directory on the source drive. This allows you to LOG files with the same name, but from different subdirectories. Then it's easier to sort them out later, when they're needed.

Since the LOG command reads the system date to determine which files to copy, be sure the data is correct before using the command.

MAPDISK [*x:*] /C/E/F/H/P

This command displays the directory and subdirectory structure on the specified drive. This is similar to the DOS TREE program, but you don't have to load it from the DOS disk.

MOVE [*source_path*]*source_filename*[*.ext*] [*target_path*] /A/C/E/Q/T/X

This command moves a file from the specified directory to the target directory on the same drive. It is a more convenient alternative to copying the file into the target directory and then deleting the original from the source directory.

If you don't specify the source directory, EZDOS assumes the file is in the current directory. If you don't specify the target directory, EZDOS moves the file to the current directory.

With the /T switch, only files with alteration dates matching the current system date are moved. With /Q, files aren't moved until you confirm your action by pressing a key.

Keep in mind that MOVE can't be used to move files to or from directories on another drive; it is for use on the current drive only.

Name *x:*[*new name*]

The 11-character volume labels permitted by DOS sometimes aren't enough to adequately identify your disks. The EZDOS Name command (abbreviated N) allows you to specify as many as 60 characters for a disk name. EZDOS displays the name when you list disk directories with the D or F commands, but not the DOS DIR command. The Name command works only with double-sided 5¼-inch disks.

NK /C/E

This command turns off the F1–F10 function-key definitions as defined with the F*n* command, and it also turns off the line-25 display. (See the K command, which turns these features back on.)

NONUMLK /C/E

This turns off the Num Lock key. It's useful to include this command in an AUTOEXEC.BAT file if you have an AT-style enhanced keyboard. These computers irritatingly boot up with the Num Lock key turned on.

P [*x:*]*filename*[*.ext*] /C/E/F/X

The P command prints the specified files on the printer. With the /F switch appended, EZDOS sends a form feed to the printer after printing each file. The filename can include wildcards, so a single command can print several files.

PATH

This shows the current DOS PATH settings. Unlike the DOS PATH command, however, the EZDOS PATH command cannot be used to change the PATH settings. EZDOS uses only the environment it inherits when it loads, so the PATH must be set before EZDOS is loaded.

PATHON /C/E
PATHOFF /C/E

This includes or excludes the current directory name in the system prompt.

PDS /C/E

This sets an IBM Graphics Printer or compatible to double-strike mode.

P3 /C/E
P6 /C/E
P8 /C/E

These commands are for configuring an IBM Graphics Printer or compatible. P3 specifies 3 lines per inch and 30 lines per page (double-spacing). P6 selects 6 lines per inch and 60 lines per page (single-spacing). P8 selects 8 lines per inch and 80 lines per page. If you use P8, also set the printer to 132 columns with the P132 command. Otherwise, the lines might overlap.

P132 /C/E
PP132 /C/E

Both of these commands set an IBM Graphics Printer or compatible for compressed print mode, 8 lines per inch, and 80 lines per page. P132 should be used for unformatted documents (no embedded form feeds), while PP132 should be used for documents that are already formatted (have form feeds).

PTINY /C/E
PPTINY /C/E

These commands configure an IBM Graphics Printer or compatible for very small print (15 lines per inch, 132 columns). PTINY also sets the printer to skip the page perforations for unformatted files. The PPTINY command is for use with files that include form feeds. If your printer overlaps lines, use the P3 command to set double-spacing before executing this command.

Quit

This command (abbreviated form: Q) ends EZDOS and returns you to normal DOS. Identical to the EXIT command.

REBOOT /C/X

Use this command only with IBM PCs and XTs—not with ATs or compatibles. If your system has a non-maskable interrupt (NMI) switch installed, this command reboots the system when you activate the switch. REBOOT installs a small keyboard routine that causes a fast boot when the Ctrl-Alt-Del keys are pressed simultaneously. To trigger a cold start, press the Ctrl-Alt-Ins combination instead of Ctrl-Alt-Del.

Note: This should be the first command in an AUTOEXEC.BAT file that loads EZDOS, since it saves

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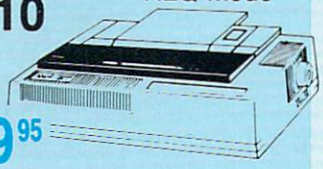

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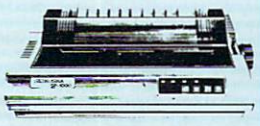

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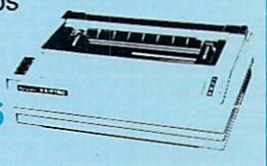

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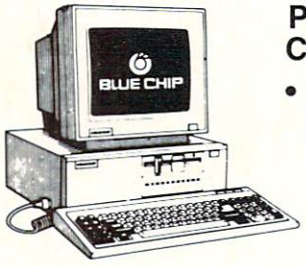

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the interrupt vectors when executed. This is necessary for the reboot process to work properly.

REMOVE [*x1:*]*filename*[*.ext*] [*x1:*] /E/N/P/Q/X/!

This command can be used to remove files from drives or subdirectories in two different ways. It builds a list of the files on drive *x1:* which have the same name as the files on drive *x2:* and deletes all of these duplicate files from *x2:* (unless you use the /N switch; see below). If you don't specify *x2:*, EZDOS defaults to the current drive or directory. The filename and extension can include wildcard characters.

Example 1. Suppose you have a large program subdirectory (C:\PROGRAMS) which contains all of the programs you normally use. You've received an update to one of the software packages and wish to remove the files associated with the older version. These files are scattered throughout the subdirectory and will take quite some time to identify and delete individually.

The REMOVE command can help with this problem. Put the original software disk for the old version in drive A. Change directories to the directory with the programs you want to delete (in this case, CD C:\PROGRAMS). Then enter the command *REMOVE A:*.* C:*. This tells EZDOS to build a list of all of the files in the directory of drive A, and then to delete any file from drive C which has the same filename and extension. For safety, add the /Q switch to the command. EZDOS then prompts you before each deletion.

Example 2. You have two disks, or a disk and subdirectory, that should contain the same files. A directory listing of the first disk shows 185 files, while the second contains only 183 files. You want to identify and remove the two extra files without deleting and recopying all 183 files. REMOVE with the /N switch can help here. The command *REMOVE A:*.* C: /N* tells EZDOS to read the directory on drive A; to check drive C to see if each of the files found on drive A are also contained in its directory; and, finally, to delete from drive A any file that is *not* in the drive C directory. Again, use the /Q option for added safety.

REName [*x:*]*present_name*[*.ext*] [*x:*]*new_name*[*.ext*] /A/C/D/E/T/Q/X

This command is similar to the DOS RENAME command, but the switches add flexibility. It also displays filenames as they are changed. Unlike the DOS RENAME command, however, it cannot handle a pathname (inclusion of a backslash). If the command contains a backslash, EZDOS passes it along to DOS for execution and the effect of the switches is lost.

If you append the /D switch, you can rename subdirectories instead of files. Only subdirectories in the current directory are renamed. Only one directory level can be renamed at a time, since the RENAME function can't handle a path specification.

SCROLL

The SCROLL command installs a DOS extension that honors the Scroll Lock key. When you list data on the screen and press Scroll Lock, the display pauses after showing 22 lines. Press the right Shift key to display 22 more lines. Press the left Shift key to advance 1 line at a time.

When you've paused the display with Scroll Lock, you'll see a message in the top right corner of the screen. Since SCROLL installs itself as a memory-resident DOS extension, it terminates EZDOS; you'll have to reload EZDOS if you wish.

Note: SCROLL uses the computer's Basic Input/Output System (BIOS), which varies between systems. It may not work correctly on some computers. It also takes over the INT 10 interrupt vector, so it may conflict with the color commands.

SET

This shows the current DOS environment, including the PATH and the value of the COMSPEC variable. Unlike the DOS SET command, it cannot be used to change the environment. EZDOS uses only the environment it inherits when it is loaded, so this must be set before loading EZDOS. (See your DOS manual for more details on SET and PATH.)

SETCODE /C

This command uses EZDOS to get user input in a batch file. This allows you to put menus into batch files. You can display menu choices with the ECHO command and then call EZDOS to get a response from the user. When the user enters one or two digits, SETCODE sets the return ERRORLEVEL to the value the user selected. DOS then compares the return code to the ERRORLEVELs in subsequent lines of the batch file and sends control to a specified batch-file label.

For example, here's a batch file you might prepare for a new or inexperienced user (or even for yourself, to save time and trouble):

```
ECHO OFF
:SELECT
ECHO Select program to run:
ECHO 1. Word processor
ECHO 2. Spreadsheet
ECHO 3. Database manager
EZ SETCODE
IF ERRORLEVEL==3 GOTO DB
IF ERRORLEVEL==2 GOTO SS
IF ERRORLEVEL==1 GOTO WP
GOTO SELECT
:DB
B:DBASE
GOTO SELECT
:SS
C:\PROGRAMS\LOTUS
GOTO SELECT
:WP
C:WORD
GOTO SELECT
```

When the user enters 1, 2, or 3, the batch file sends control to the labels WP, SS, or DB, respectively. Following these labels are commands to run the appropriate programs.

Notice that ERRORLEVEL codes must always be inserted in the batch file in *descending* order, since DOS searches for an ERRORLEVEL which is either equal to or less than the code returned by SETCODE.

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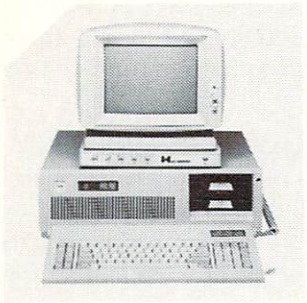

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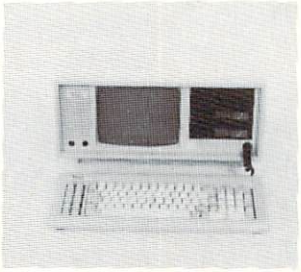

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If the ERRORLEVELs aren't in descending order, DOS executes every ERRORLEVEL line.

Note: All batch files that include EZDOS commands normally require you to append the /E switch to the line which contains the EZDOS command. As seen above, this isn't necessary with SETCODE.

SF*n* *'definition'* /A/C/E

This command sets the Shift–function key definitions. Specify a number in the range 1–10 for *n* representing the function key being defined. Substitute your own string for *definition*, surrounded by single quotation marks. EZDOS automatically types the string when Shift and function key *n* are pressed at the same time. Use WRITEZ to make them permanent.

You can include a carriage return in the key definition by including the caret (^). This makes it possible to execute a command by simply pressing Shift and key F*n*. The STATUS command displays the first 20 characters of this string.

Without ANSI.SYS installed, the definition is limited to 20 characters. Strings longer than 20 characters can be stored when ANSI.SYS is installed and EZDOS has been notified of that fact with the ANSI command. Also, with ANSI.SYS installed, key definitions may be used after you exit EZDOS. The ANSI driver has a limit of around 200 characters, so your definitions can't total more than that.

Status /C/E/F/P

This command displays how much free random access memory (RAM) is available in the computer; the number of floppy disk drives; the highest drive letter installed or the highest drive letter available (depending on your DOS version); the addresses of the serial and parallel ports; whether or not the system has a game adapter; and the first 20 characters of the Shift– and Ctrl–function key definitions. If the DSTAT command has been executed, the status counters for disk activity are also displayed.

If you're running a DOS version below 3.0, STATUS shows the drive letter of the last drive actually available. When running DOS 3.0 or higher, STATUS shows the current setting of the DOS LASTDRIVE command (the default is drive E).

REPEAT[H] *command* /E

REPEAT executes the specified command in not only the current directory, but also all of its subdirectories. If REPEATH is entered, hidden subdirectories will be accessed also.

For example, to copy an entire hard drive to floppies, and at the same time preserve the directory structure, first enter CD \ to get to the root directory of the hard drive. Then enter the command *REPEAT COPY* *.* x: */P* where *x:* is the target floppy drive.

Any switches that are allowed when a command is used alone can also be used when the command is REPEATed.

If /E is specified, EZDOS exits after the command has been executed in all appropriate directories. (See the section on hard drive management in the main part of the article.)

Note that REPEAT operates only on subdirectories within the current directory. That's why, to make changes throughout all hard drive directories, it's necessary to change to the root directory.

If a command such as DELETE is used with REPEAT, it's advisable to append the /Q (query) switch so EZDOS requests confirmation before each deletion.

T [*x:*]*filename*[*.ext*] /C/E

This command is similar to the DOS TYPE command, except it allows the use of wildcards in the file specification. All of the files specified are typed on the monitor; unlike TYPE, T doesn't allow you to redirect output to a printer. Use the P command for hardcopy instead.

Unlike TYPE, T won't accept a path in the filename.

UNHIDE [*x:*]*filename*[*.ext*] /C/E

This command turns off the hidden-file attribute for the named file or subdirectory. When a file or directory is hidden, it won't show in a normal directory listing, and the DOS COPY command won't copy it to another drive. Use HIDE to turn it back on.

TIMEON /C/E
NOTIME /C/E

These commands include or exclude the current time in the system prompt.

WRITEZ /C/E

This writes a new copy of EZDOS (including all settings) to the default disk drive. This is useful when you've changed any internal defaults, such as the prompt, Ctrl– or Shift–function keys, ANSI command setting, or HELPON/OFF. The new version on the default disk incorporates these settings so they don't have to be reentered when EZDOS is loaded.

Xeq *DOScommand* /A/C/E

Some EZDOS and DOS commands have the same name, but have different effects (COPY and DELETE, for example). The Xeq command sends the command following it to DOS for execution, rather than to EZDOS. For example, this provides a way to use the DOS COPY command to copy files between subdirectories, which the EZDOS command can't do.

Note that the switches which can be used with the EZDOS commands have no effect when passed to DOS. In fact, they'll provoke an error message. **PC**

Trapping Disk Errors In *Turbo Pascal*

Doug Burger

Here's an indispensable aid for programmers who use Turbo Pascal: *an error handler that makes sure your programs won't crash when accessing a disk drive or printer that doesn't respond for some reason. The error handling routines are included on this issue's magazine disk and can be added to any* Turbo Pascal *program.*

You've spent weeks, perhaps months, writing an important program in *Turbo Pascal*, and now, it's finally finished. Whether you wrote it for yourself or someone else, you're proud of your handiwork and anxious to show it off.

But the first time your program sees the light of day, the unthinkable happens—it crashes. Embarrassed, you realize there is no provision in your program for an unusual input/output error that *Turbo Pascal* can't handle. These *critical errors* include

- Attempting to read from or write to an unformatted disk.
- Attempting to write on a write-protected disk.
- Trying to read or write a file when the drive door is open.
- Attempting to read from or write to a drive in which the user forgot to insert a disk.
- Sending data to a printer that's not hooked up.

When a critical error occurs, DOS takes control of the computer away from your *Turbo Pascal* program and issues its infamous ultimatum—*Abort, Retry, Ignore?*. This message not only defaces your carefully designed screen, but can also have more serious consequences. If users press A for Abort, they'll find themselves back at the DOS prompt. When this happens, important data created with the program may be lost, disk files may remain open, and important low-memory addresses may be disturbed. Users need better protection than *Turbo Pascal* and DOS permit.

Wouldn't it be nice if your *Turbo Pascal* program could retain control of the computer when a critical error happens? That way, you could arrange for users to see a message such as *Please close the drive door* or *Your printer is not connected* instead of the DOS ultimatum. The result would be a more professional-looking program that protects users against lost data.

Retaining this kind of control isn't difficult. Adding two procedures and a function to your program will do the job. These routines are included on this issue's magazine disk, and we'll explain in detail how to use them.

An Error-Trapping Demo

You'll find the source code for the error-handling routines on the magazine disk in a file called ERRORPRF.PAS. A compiled version is also included in the file ERRORPRF.COM. The latter file demonstrates how a *Turbo Pascal* program can retain control of the computer when a critical error occurs. This demo requires a system with two floppy disk drives, but the general principle applies to all types of systems.

To run the demo, insert the disk with ERRORPRF.COM in drive A and put another disk in drive B. When you run ERRORPRF, it prompts you to open the door on drive B and press Enter/Return. Then it attempts to write a file called TEST on the disk in drive B.

Naturally, it won't succeed, since the drive's read/write head isn't in contact with the disk unless the door is closed. But instead of the error message from DOS you might expect to see, you'll receive the following message from the *Turbo Pascal* program:

Create File failed
"Normal" error is 241
Extended error code is 21

Then, the program ends.

If you leave the drive door closed, on the other hand, ERRORPRF writes the file TEST to drive B and prompts you to open the door. ERRORPRF then attempts to close the file while the door is open. When that obviously fails, you'll get another error message, again, from the Turbo Pascal program—not from DOS.

Notice that throughout this demo, the *Turbo Pascal* program remains firmly in control of the computer, never relinquishing its grip to DOS. The user need never encounter the ominous *Abort, Retry, Ignore?* message.

Two New Procedures

The source code file ERRORPRF .PAS contains the routines you'll need to add critical error handling to your own programs: the procedures *Enable24* and *Disable24*, and the function *Extended_Error*. Their variable and constant declarations must also be included in your own programs.

Enable24 is the procedure that installs the new critical error handler; Disable24 removes it. Extended_Error is a function that reads the new error codes returned by the error handler. All three must be included in your program.

You must also include the *Int24* constant array of bytes, the *register* record, and integer variable declarations. The *errcode* integer variable and the Int24 array must be global variables—they need to be declared in the main program. Be sure to enter this code exactly as shown, or the procedure won't work.

Use the block commands in the *Turbo Pascal* text editor to read the source code from ERRORPRF .PAS and insert it at the correct point in your program. (If you aren't sure how to do this, refer to page 28 of your *Turbo Pascal* manual.) Include the code for both procedures, the function, and their related declarations, but omit the lines pertaining to the demo program.

Another way to include the code in your own program is to use the $I compiler directive. This instructs the compiler to include source code from a separate disk file—in this case, ERRORPRF.PAS. See the section on the $I directive in Chapter 17 of your *Turbo Pascal* manual. Again, don't forget to omit the lines pertaining to the demo.

Setting The Error Traps

Here's a quick rundown on how to use the critical error handler. The first step is to call the Enable24 procedure. This replaces the DOS critical error routine which prints the *Abort, Retry, Ignore?* message. Next, whenever your program reads or writes to disk, call the *Turbo Pascal* IOResult function to trap any ordinary errors. Then, call the new Extended_Error function to trap any critical errors. Finally, call the Disable24 procedure to reinstate DOS's original critical error handler, just to tidy up.

IOResult, as you probably know, is a standard function in *Turbo Pascal* that allows you to check for errors that occur when reading or writing files to disk. Ordinarily, the function is inserted in the program immediately after the code which performs the I/O. If IOResult returns a zero, no problems have occurred. If IOResult returns a nonzero value, the number indicates the type of error so your program can react accordingly. A complete listing of the IOResult error codes can be found in your *Turbo Pascal* manual.

The new Extended_Error function works much like the standard IOResult function. Within your program, call Extended_Result after every I/O operation (Reset or Write, for example). If zero is returned, there is no critical error. A nonzero value indicates a critical error, so your program can display an appropriate message and take corrective action.

As with the IOResult function, a second call to Extended_Result in sequence always returns a zero. And because the new error handler also generates a *Turbo Pascal* error, a call to IOResult is also necessary to reset *Turbo Pascal*'s own error routines. Calling Extended_Result alone is not enough.

Here are the new error codes reported by Extended_Result:

19 Attempt to write on write-protected disk.
20 Unknown unit.
21 Drive not ready.
22 Unknown command.
23 Data error.
24 Bad request structure length.
25 Seek error.
26 Unknown media type.
27 Sector not found.
28 Printer out of paper.
29 Write fault.
30 Read fault.
31 General failure.

For example, your program can now issue the message *Drive not ready* when the drive door is open (Extended_Error returns a 21). Or *General failure—check disk* when an unformatted disk is accessed (Extended_Error returns a 31). Or *Your disk is write-protected* when a piece of tape covers the write-enable notch. If your program tries to access a printer that's not turned on, the message *Printer error* can be displayed (error 28). Such messages make your program more friendly and safe to use.

How It Works

The machine language code for the critical error handler is set up in an array constant of bytes called Int24. Interrupt vector number 24h is originally set to point to the DOS critical error-handling routine located in COMMAND.COM. This is the routine that prints the *Abort, Ignore, Retry?* message. The Enable24 procedure changes the Interrupt 24h vector to point to the Int24 array, and hence to the new error handler.

In addition, the address of the *Turbo Pascal* variable errornum is inserted into the routine so it can save the error number. The code in the Int24 array is thus executed whenever there is a critical error, and control of the computer stays within the *Turbo Pascal* program.

For example, suppose the user leaves the drive door open. When your program attempts to access the disk, it calls the DOS routine that performs the disk operation. When this DOS function encounters the critical error, it makes another DOS call to the Interrupt 24 vector, which in turn has been reset to point to the error handler in the Int24 array.

The machine language code in the array removes the return address of the system call from the stack by adding to the stack pointer; puts the error code from the DI register into the AX register and extends it by adding 19; stores the AX register value in the *Turbo Pascal* variable errornum; sets the AX register to 00FFh, which is an error flag recognized by Version 1 DOS function calls; and, finally, sets the carry flag, which is an error flag recognized by later (version 2.0+) DOS function calls.

When the RET 2 instruction is executed, the program resumes at the address now at the top of the stack. This is the address of *Turbo Pascal*'s original call to DOS.

Note that in terminating the error handler, the routine could have set the AL register to zero, which would tell DOS to ignore the error. This would return control to DOS instead of *Turbo Pascal*—however, just as if the user pressed the I key at the *Abort, Retry, Ignore?* prompt. If this method were used, DOS might or might not set the carry flag to indicate an error. The method presented here insures that the carry flag is set. DOS versions 3.0 and higher have the option of failing the system call in progress (moving a 3 into the AL register). This return code would work only in systems running DOS 3.3; other systems would be excluded. **PC**

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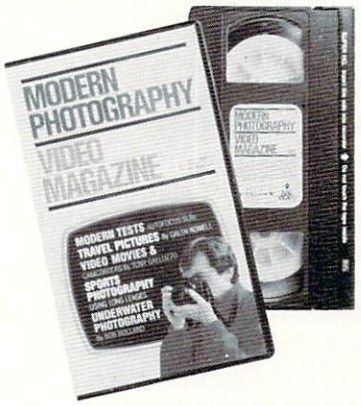

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A *Flight Simulator* Adventure

A Winter's Tale

Microsoft's Flight Simulator *is one of the most popular programs available for IBM PCs and compatibles, and many thousands of PC owners enjoy an occasional tour through the clouds. This article guides you on a flight in the San Francisco Bay Area and provides tips for polishing your flying techniques. A copy of Microsoft's* Flight Simulator *and SubLOGIC's* San Francisco Star Scenery Disk *is required. Charles Gulick is the author of* 40 Great Flight Simulator Adventures *(COMPUTE! Books, 1985),* 40 More Great Flight Simulator Adventures *(COMPUTE! Books, 1986),* Flight Simulator Co-pilot *(Microsoft Press, 1986), and* Runway USA *(Microsoft Press, 1987).*

When you set the accompanying parameters and exit the Editor, you'll find yourself on a little finger of land just north of the San Francisco-Oakland Bay Bridge. Switch on the radar and zoom out (press the minus key) six times to get an idea of your situation. The airport south of the bridge is Nimitz Field.

Looking out the windshield again, the Golden Gate Bridge is on the horizon. Behind the high-rise is Mt. Tamalpais, on the north side of the Golden Gate.

If you're using a composite rather than an RGB monitor (in my opinion, the only way to go), the color green is, of course, one you're all too familiar with. Along with blue, it's the simulator's favorite hue. But on this bitter winter morning, this particular little patch of green is a rarity. It might almost be deemed precious. Why? Because you and your Cessna are surrounded by a world of snow, as we'll see in a moment.

Charles Gulick

The Editor parameters should have your plane correctly trimmed for the high-performance takeoff I described in the September issue of COMPUTE!'s PC Magazine. The elevator is adjusted as if you had manually trimmed it down five quick presses from its full-up position. Your flaps are extended ten degrees. Note also that auto-coordination is disabled, which means that on the ground, you'll steer with the rudder pedals (though you'll probably have no steering to do on this takeoff because you're already lined up with the runway).

Feel free to use the Pause feature as you execute this flight, reading a bit ahead to anticipate what happens next. Then unpause (if there was never such a word, there is now) and continue at your own pace.

Note: To begin this adventure, run your copy of *Flight Simulator* and remove the disk from the drive. Then insert the *San Francisco Star Scenery Disk* and press Ctrl-E. When the program says *Press any key to continue*, hit a key and then quickly press Esc to reach the Editor screen. (If your scenery disk is like mine, you may wind up at the bottom of Lake Michigan if you don't press the Esc key soon enough. Hit Esc as soon as you see the water out there. That way you beat the simulator at one of its own many games.) Leave the scenery disk in the drive.

Next, enter the following parameters on the Editor screen. If no parameter is given, use the default setting. Press Ins to save the parameters. You may have to press the PrtSc key to correct the simulator's heading.

We recommend using keyboard controls instead of the joystick for this flight. Also, you may want to read through the exercise before you start flying, so you'll know what the flight involves.

Editor Parameters

Auto-coordination:	Off 0
North position	17418
East position	5117
Altitude	0
Heading	250
Flaps	8192
Elevators	44799
Time: Hours	8
Minutes	0
Season: Winter	1
Cloud layer 1 tops	7
Cloud layer 1 bottoms	5
Surface wind: Knots	3
Degrees	250

Time For Takeoff

Make sure your carb heat is off and begin your takeoff run. When the airspeed reads 50 knots, rotate with one notch of elevator back pressure. Cancel that notch as soon as you leave the ground, then retract the landing gear and zero your flaps. Trim the aircraft with six sets of two quick presses of down elevator (that's 12 presses in all), applying each set as the horizon seems to move downward on your windshield. Then reduce power to 2105 rpm. You'll settle into a climb at about 500 fpm (feet per minute).

You should be trimmed out (elevator at operational neutral) by the time you've climbed to about 1000 feet. Just fly toward the Golden Gate Bridge for the moment, planning to level off at 1500 feet. That will simply require a power reduction to 1905 rpm.

Look out your windows. Not only is the ground covered by snow, but the Bay is too; it is apparently completely sheathed in ice.

Be aware that you're flying over a singular landscape, one which occurs only when using the *San Francisco Star Scenery Disk*. It is doubtful that you'll ever see snow like this again, in any simulation or with any *Scenery Disk*, in any season (unless, of course, you write letters to your congressman—with copies to Microsoft and SubLOGIC—demanding they make this beautiful snow a standard weather option). Why? Because this wasn't meant to be snow. It was meant to be *fog*, according to the instructions with the disk. I much prefer to think of it as snow, however. On the latest scenery disks, fog has become just a faint haze over the usual landscape, which you can experience in the otherwise splendid *Scenery Disk 7*, if you care to. It doesn't look anything like fog to me.

So the simulator snows only in San Francisco. That may make your *San Francisco Star Scenery Disk* something of a collector's item.

Perhaps you've also noticed that there's even some snow on the edges of your instruments; the resulting glare may render them virtually unreadable, as it has mine. If you can't read the instruments, and you need to check the engine rpm or something, go briefly into radar mode; the panel lights up like a Christmas tree.

Frozen Ocean

Our purpose this morning, besides enjoying the winter world, is to see if there's somewhere else in the area—besides the patch of green we just left—where we can set the airplane down on terra firma. (I once thought I saw one of Nimitz's runways plowed clean, but it may have been an illusion.)

As you approach the ocean, note that it, too, is completely snow-covered. This is the first time in history the Pacific Ocean has frozen over, and many skaters are out there enjoying the novelty.

When you no longer see the Golden Gate Bridge, turn left to a heading of 163 degrees. This should keep you to the right of San Bruno Mountain. Take a look out all sides of the aircraft and observe the extent of the white stuff. Magnificent.

When the last snippet of San Bruno Mountain disappears, you'll see nothing but white on the landscape. You might as well be on top at 1500 feet, even though this is a cloudless day.

Turn left just a bit now to a heading of about 137 degrees. Be respectful of the mountain. Out the left front window you would normally see San Francisco International Airport, but today it's completely obliterated by snow. And out the right front window, far away, is Half Moon Bay Airport, also buried.

Although you can't see it, you're actually paralleling Interstate 280. (You can assess the whole situation on radar any time the desolation up here gets to you.)

Navigating By VOR

Tune in the Woodside VOR station on your NAV radio; its frequency is 113.90. Set the OBS (Omni-Bearing Selector) to center the needle, and you'll find you're on, or close to, radial 138 with a TO reading. Note the DME (Distance Measuring Equipment) reading, too—you're probably about a dozen miles out.

We'll stay on this radial for the moment, so if you're not already on it, set the OBS to R138 (R is short for radial) and fly to get the needle centered. If you're not familiar with the technique of "flying the needle," the idea is to turn toward the needle whenever it is left or right of center. When the needle is centered, you're on the radial, so you then turn to the DG (Directional Gyro), or compass heading, that agrees with the OBS. If the wind or some other factor causes the needle to further deviate from center, you make another (small) correction to bring it back.

Your ultimate heading and the radial number may disagree by a few degrees when things settle down, but as long as the needle remains centered with a TO indication, you're on the radial and headed straight for the Woodside OMNI (slang for VOR station).

The best way to make a minor course correction, since auto-coordination is switched off and your rudder control is independent of aileron, is to turn the rudder and yaw the nose left or right a degree or so. When you're securely on the desired radial and your DG heading is a higher or lower number than the radial, you are *crabbing*—the airplane is flying slightly sideways through the air in order to maintain a straight course over the ground.

Changing Course

When the DME reads about eight miles, another mountain will erupt out of the snow, slightly left of your course. Pause at this point until you've read the next two paragraphs.

When you're close (within a few miles) of an OMNI, the needle goes haywire and should be ignored. The radials all come together at this point, and the needle ultimately pins in the direction of

the VOR station itself. Many student pilots have become disoriented by emphatic needle movements at this stage of a flight, turning far off course in order to "catch up" to the OBI (Omni-Bearing Indicator). So the moral is, if you've been uneventfully tracking a radial for a while, and suddenly observe extreme needle movements to the left or right, check your DME before making any corrections. Usually your desired flight path is straight ahead.

This morning, however, we're going to fly the Woodside VOR only to a certain point—half a mile or so this side of the station—then intercept a radial to another VOR at San Jose, California. The interception technique we'll use is of inestimable value in precise cross-country VOR navigation.

Unpause the simulator now and tune the NAV 2 radio to the San Jose VOR frequency, 114.10 (press 2 before you press N for NAV). Next, crank the OBS around (again, press 2 before you press V) until it reads 080 degrees TO. The OBI needle will probably read off-scale at this time.

You're now ready for the interception. You're continuing to fly R138 to Woodside, using NAV 1. But your NAV 2 is set to tell you when you intercept R080 to the San Jose VOR.

When the DME shows you're approximately four miles from the Woodside OMNI, the OBI associated with NAV 2 starts to move. Ignore NAV 1 at this point, hold your present heading, and regularly check NAV 2. When the NAV 2 OBI needle is a needle's width from the dot at the center of the indicator, turn left to a heading of 080 degrees (use the DG instead of your compass, since the latter tends to lag considerably in a turn).

You've now intercepted R080 to San Jose and are flying straight toward the San Jose OMNI. As you can see on your area chart, the OMNI is located at San Jose International Airport.

Plotting Your Position

Although you're flying toward the San Jose OMNI, your DME is still reading the distance to or from the Woodside OMNI, since the DME is associated only with the NAV 1 radio. Let's correct that situation.

Press the 1 key to unlock the prior NAV 2 connection and retune NAV 1 to the San Jose frequency, 114.10. Then set the OBS (again, press 1 first or you'll be setting OBS 2) to R080. The OBI 1 needle now comes to (or close to) the center of the instrument, the DME reads your distance from San Jose, and you're in business. Ignore NAV 2 and fly the NAV 1 needle as previously described.

When you're on R080, pause a moment.

To understand a little better what we've done with this course change, let's plot our position on the San Francisco area chart. Using a straightedge, draw a light pencil line through the center of the Woodside VOR so that it intersects approximately 138 degrees on the Woodside compass rose. Zeros are dropped on the rose, so draw the line to intersect what would be 138 (14 is close enough) if the zeros were added. Now draw a line that intersects your first line, the center of the San Jose compass rose, and San Jose R080. (The runways at San Jose hide the center of the rose on the area chart, so just eyeball it. Also, each major division of the rose marks off ten degrees, so simply count back from 12—or 120 degrees—to find 080.)

The line through Woodside represents the course you were following before you turned east. Where the lines intersect, slightly north of Woodside, is where you intercepted San Jose R080 and turned toward that station. The line to San Jose, of course, marks the course you're flying along now.

Unpause the simulator and continue flying the needle.

Approaching San Jose

For a short while you'll see nothing but snow ahead. Then, when the DME shows you're approximately ten miles from San Jose, some mountains rear up. Dimly etched against them are a few of the buildings of downtown San Jose.

If you listen closely, you'll hear the simulator access the scenery disk for more information. At this point, look out of your left front window and pause the simulation.

There's something over there that isn't white!

Unpause again just long enough to get into radar mode. Zoom in to find that distinct feature at about ten o'clock from your position, then pause again.

Use your area chart to determine what you're looking at. Don't read any further until you're satisfied you know exactly what it is.

Unpause, exit radar, and return to your 45-degree out-the-window view. Pause again. That's surely Moffett Field NAS (Naval Air Station), and it looks as though one or both of its parallel runways might just be plowed. Certainly the old dirigible hangars are distinctly visible, and there are some vague indications of centerline markings.

Let's fly over there and see what's up.

Aiming For Moffett Field

Unpause the simulator and turn toward Moffett, aiming in the general direction of the hangars. (*Flight Simulator* is always full of surprises. Until I tried this flight, I didn't know that a routine landing at Moffett—or any other airport—might be possible.)

As you come closer, the runways certainly seem to be there. And even some grassy areas around the hangars.

When the runways disappear under the plane's nose, switch to your ground view (straight down) and take a look. Sure enough, both the runways and the hangars are visible. Then check your rear view to confirm that it's no optical illusion.

So let's shoot a landing at Moffett. Since the wind is from 250 degrees and the runway numbers are

14/32, this will be a crosswind landing either way we go, but Runway 32R or 32L will give us a slight advantage.

Ignore the outer marker signal if you get one, and turn right to a heading of 140 degrees. This bearing, the reciprocal of 320 degrees, puts you downwind for a righthand pattern for either of the parallel runways. We'll use 32R. When you're on heading 140, you should be able to see the airport from your right windows. Elevation at Moffett is 34 feet, so it's time to start your letdown.

Applying carburetor heat alone should set up a descent rate of about 350 fpm, so turn on the heat. But further, trade off gradually lowered throttle settings and gradual elevator back-pressure to slow the plane to about 100 kilometers indicated air speed, all the while maintaining a descent rate consistent with a good approach. When the airport can no longer be seen out the right window, turn right to a base leg heading of 230 degrees. Now you should be able to see Moffett Field from the right side, shouldn't you?

Case Of The Disappearing Runway

What happened? Did Moffett disappear—and if so, where did it go? During my flight, anyway, Moffett temporarily vanished, even from radar, until a simulator disk access brought it back—but back it came.

Remember to drop your landing gear on the base leg or final leg, whichever suits your situation and your relationship to the runway. (Hint: A few notches of throttle before lowering the gear helps prevent excess loss of altitude resulting from the increased drag.) Make your final approach (a right turn to 320 degrees) at a point which is consistent with your out-the-windshield perspective and your best judgment—then take her down.

So it looks like there *is* a runway in the San Francisco area which gets plowed immediately after a snowstorm. This gives us a great point of departure in the future when the white stuff falls, and even a trio of hangers where we can keep our Cessna high and dry.

But why is Moffett singled out for clean runways when even San Francisco International is blanketed with snow? Is it because Moffett, elevation 34 feet, is above the drifts? (SFI, at ten feet, is also above the snow line). If elevation is the determining factor, then San Jose International, at 56 feet, should also be plowed. Let's find out.

Go into the Editor and set North 17186, East 5163, Altitude 0 (that altitude is always a good idea; it prevents crashing and burning, and the resultant melting of the snow), and Heading 30. This places you at a 90-degree angle just alongside where runway 12R/30L should be.

Exit the Editor and look out the windshield.

No runway 12R/30L. No runway anywhere in sight, except on radar. Taxi ahead, observing radar, until it indicates you're on the center of the runway. Then exit radar and look to all sides. Still no runway.

Conclusion: Except for Moffett Field, the snow job afforded by the *San Francisco Star Scenery Disk* fog feature seems to be complete. I leave it to your ingenuity, if you're of such mind, to explore other airports in the area and see what you can find. If you come across another plowed strip in your search, let the Federal Aviation Administration know so they can issue a NOTAM (Notices to Airmen)—or maybe a white paper. **PC**

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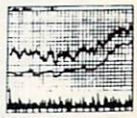

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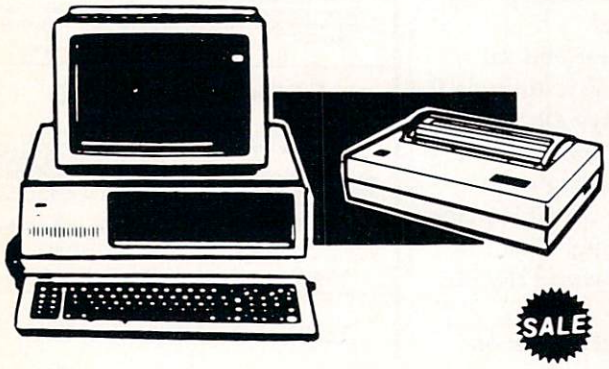

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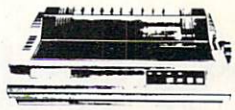

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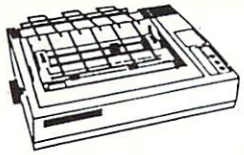

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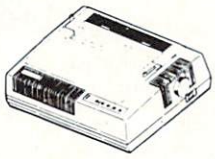

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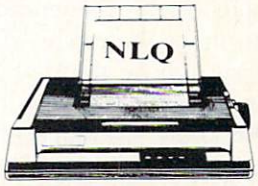

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RoboKey

Tim Midkiff, Editorial Programmer

Now you can set up your computer to perform almost any task completely unattended—quickly, efficiently, and automatically. This short program lets you define as many as 200 keystrokes that will be entered for you at a time you specify within the following 24 hours. You can automate DOS operations or virtually any application program. It works with any IBM PC, PCjr, XT, AT, or compatible with DOS 2.0 or higher.

Personal computers are supposed to automate some of the tasks we used to do manually and thereby make life a little easier. And indeed, word processors, electronic spreadsheets, database managers, and numerous other programs can be marvelously productive in the hands of an experienced user.

But that's the catch—it takes the hands of an experienced user on the keyboard to really make things happen. Until now.

"RoboKey" is a handy little program that types your instructions and commands on the computer whether you're there or not. You can be in the next room watching TV, across town visiting a client, or even fast asleep. Before leaving the computer unattended, you simply tell RoboKey which keys to press and at what time to press them. RoboKey is flawlessly punctual; when its "alarm" goes off (anytime in the following 24 hours), RoboKey types the keypresses on the keyboard just as if you typed them yourself.

The predefined keypresses can be DOS commands, instructions to run programs, commands within programs, or anything. You can set multiple alarms so RoboKey will perform several operations at different times. You can even tell RoboKey to run batch files, which in turn may carry out their own lists of commands.

There are thousands of uses for a program like RoboKey. In an office, you could set up your computer to automatically back up important files at the end of the day so you don't waste time doing it yourself. At home, you could instruct your favorite terminal program to dial up an information service in the middle of the night when rates are low, download stock quotes or electronic mail, log off, and print everything out so it's waiting for you by breakfast. In fact, you can set up a computer to perform *any* routine task during off-hours in order to maximize productivity.

You've probably heard of virtual memory and virtual disks. Now, with RoboKey, you can have a *virtual user.*

Setting The Alarm

Not many programs as useful as RoboKey are as easy to use. There aren't any tricky commands to learn, and you can be up and running with it in minutes.

This issue's magazine disk contains a file named ROBOKEY.COM. This is the RoboKey program. Notice how short it is—about 1.5K. RoboKey is written completely in machine language to be compact and efficient.

Before running RoboKey, we recommend making a backup copy on another disk. Also, if your computer lacks a battery-powered realtime clock, use the DOS commands DATE and TIME to set the current date and time of day.

To run RoboKey, simply insert a disk with ROBOKEY.COM in the current drive and then type ROBOKEY. The program displays the current time and asks you to specify a time for the "alarm"—in other words, when the automated commands are to be carried out. Enter the time in the format *HH:MM*

for hours and minutes, and follow this with *AM* for the morning hours or *PM* for the afternoon/evening hours. For example, you'd enter *12:15 PM* for 12:15 p.m., *01:10 AM* for 1:10 a.m., and so on.

If you omit the *AM* or *PM*, the alarm goes off at the next occurrence of the time you enter. For instance, if it's 5 p.m. and you enter the alarm setting as *07:00*, the alarm will go off two hours later, at 7 p.m.

Entering Commands

After you set the alarm, RoboKey asks you to enter the characters you want typed on the keyboard at the appointed time. You can enter anything you want—DOS commands, the names of programs to be loaded and run, commands within programs—anything. RoboKey remembers every keypress you enter and automatically repeats them when the alarm goes off. In effect, you're writing a script that RoboKey will follow to the letter.

To include a carriage return in this script, simply press Enter/Return as you normally would. RoboKey memorizes everything you type, with one exception: the Backspace key. If you make a typing mistake and need to make a correction, press Backspace; as usual, the cursor backs up one space and erases the previous character. You may continue pressing Backspace to erase the whole line, if you wish. If you want to include the Backspace key in a script for some reason, enter it by pressing Shift-Backspace.

If you really mess things up, you can abort the whole script by pressing Ctrl-Break and then start over.

You can enter as many as 200 characters in a RoboKey script. To mark the end of the script, press the Esc key three times. At this point, the alarm is set.

You can continue using the computer for anything you want after setting an alarm. RoboKey installs itself in memory and stays out of the way, silently waiting for the alarm to go off. At the prearranged time, RoboKey stirs to life and types the keystrokes it memorized on the keyboard, just as if you typed them yourself. When RoboKey is done, it returns manual control to the keyboard.

Additional Notes

You can set multiple alarms merely by repeating the process described above. For instance, you could make RoboKey perform some task at 1 a.m. and make it do something else at 3 a.m. Leave enough time for the computer to carry out the first job before beginning the next.

If the commands you want RoboKey to execute won't fit within the 200-character limit, either set additional alarms to finish the job or have RoboKey run a batch file. By chaining together batch files and multiple RoboKey scripts, you can make the computer do almost anything.

All RoboKey alarms currently in memory are aborted and all scripts erased if you reboot the computer by simultaneously pressing Ctrl-Alt-Del.

Be sure the computer is in the proper state to accept RoboKey's keypresses when the alarm goes off. For example, if you tell RoboKey to run a certain program by entering its filename on the DOS command line, make sure the correct disk is in the drive and the DOS prompt is on the screen before leaving the computer unattended.

If you continue using the computer after setting an alarm, don't forget what's going to happen when the alarm expires. It might be embarrassing, for instance, if RoboKey suddenly springs to life and tries to run a telecommunications program on top of your spreadsheet. Remember, when RoboKey activates, it's just as if someone bumped you off the keyboard and took control of the computer. Before using RoboKey for something important, test it first so you know exactly how it works and to make sure it's compatible with your other software.

Also on the magazine disk is a file named ROBOKEY.S. This is the machine language source code for ROBOKEY.COM. The source code is not required to run RoboKey; it's included for programmers who wish to study how the program works. RoboKey was written with *A86*, a shareware assembler. **PC**

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Wrimage

John W. Ratcliff

Here's a word-guessing game for those long winter evenings, and it helps improve spelling and vocabulary skills, too. Four difficulty levels make it suitable for anyone from children to professors. One to six people can play, so it's an ideal party game. The program runs on any IBM PC, PCjr, XT, AT, or compatible with DOS 2.0 or higher and a color/graphics adapter or equivalent hardware.

Guessing words and phrases is the fashion on TV game shows. But you have to wait until your favorite show is on—or worse, miss it if you're busy. How about a word game that's always ready to play when you are and isn't interrupted by commercials?

"Wrimage" (short for *word image*) is both educational and fun—a game that helps people of all ages improve their spelling and vocabulary skills. Multiple difficulty levels make it suitable for youngsters or oldsters. You can play Wrimage by yourself or with up to five other people.

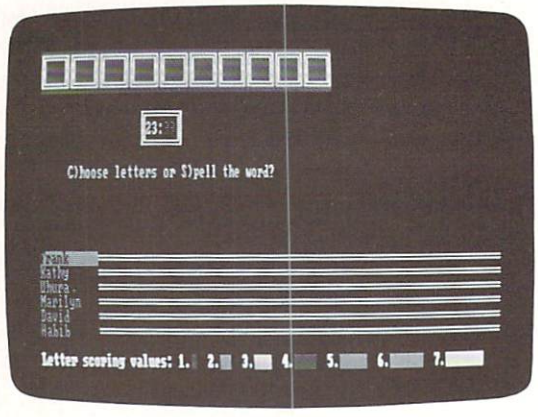
The Wrimage word list provided on the magazine disk contains about 3000 words. The easier words were collected from elementary- and middle-school spelling books, and the harder ones were culled from a variety of dictionaries. You can also prepare your own word lists to drill students on spelling words or special terminology.

Best of all, Wrimage is easy to play. The rules can be mastered in a few minutes, yet it can provide hours of entertainment.

Running The Program

Wrimage runs on any IBM PC, PCjr, XT, AT, or compatible with DOS 2.0 or higher and a color/graphics adapter (CGA) card. Some compatibles have the equivalent of a CGA card built into their hardware; check your computer manual to be sure.

Figure 1: It's the beginning of a round, and empty squares representing the mystery word appear at the top of the screen.



Before running Wrimage for the first time, we recommend making a backup copy on another disk. You'll need to copy two files: WRIMAGE.EXE (the game program) and WRIMAGE.LST (the word list). If you copy WRIMAGE.EXE into a subdirectory, make sure WRIMAGE.LST is copied into the same subdirectory. The program automatically loads the word list from the current directory when it runs.

You'll find two other related files on the magazine disk: WRIMAGE.C and WRIMAGE.ASM. These are source code files for programmers who wish to study how the program works. They aren't executable programs, and they're not required for playing Wrimage. WRIMAGE.C is the main source code file, written in Borland International's *Turbo C*. WRIMAGE.ASM is a machine language routine for printing text on the CGA screen.

To play Wrimage, run the program from DOS; simply enter WRIMAGE at the DOS prompt.

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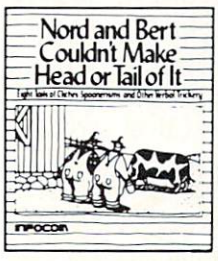

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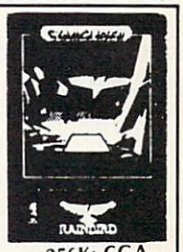

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Choosing Game Options

The opening screens allow you to set up the game. The first screen asks if you want sound effects; press Y for Yes or N for No.

Next, Wrimage displays this menu:

Play at what level?
1. **Easy words.**
2. **Medium words.**
3. **Hard words.**
4. **Mixed levels.**

Choose 1, 2, 3, or 4 and press Enter/Return.

After this, Wrimage prompts you for the number of players (1–6) and the names of the players. If you make a typing mistake, you can press the Esc key to redo the previous entry. Also, after all of the players' names are entered, the program asks you to confirm your entries. If you made any mistakes, type N to start over.

You can break out of the program and return to DOS at any time by holding down the Ctrl key and pressing C.

Playing The Game

The rules of Wrimage are simple. The object is to be the first player to fill the horizontal fuel gauge to the right of your name. You gain points by picking letters and spelling words correctly, and you lose points by picking wrong letters and spelling words incorrectly. A blue line on the fuel gauge indicates a positive score; a red line means your score is less than zero.

At the beginning of each round, blank squares appear at the top of the screen. Each square represents one letter in the word the players are trying to guess. (See Figure 1.) During each turn, a player can either choose letters (press C) or attempt to spell the word (press S). In either case, a 30-second timer begins counting down; if it expires, you don't lose points, but you lose your turn.

When a round begins, no letters in the word are known, so the logical way to start is to press C to choose letters. As shown in Figure 2, three letters appear in the center of the screen. At least one of the three letters is guaranteed to be part of the word; the program picks the other two at random.

To make a guess, press the key which corresponds to the letter you're choosing. If you guess right and the letter appears in the word, the program displays the letter in its proper position and you get another turn (Figure 3). If the letter appears more than once in the word, it is shown in every position.

If you guess wrong, it's the next player's turn.

The Scarlet Letter

Different letters have different point values based on the frequency with which they occur in the English language. You can find each letter's point value by matching its color with the color scale at the bottom of the screen. Thus, a Z is worth more than, say, an *E*.

Figure 2: The player must choose from the three letters displayed in the center of the screen—or pass.

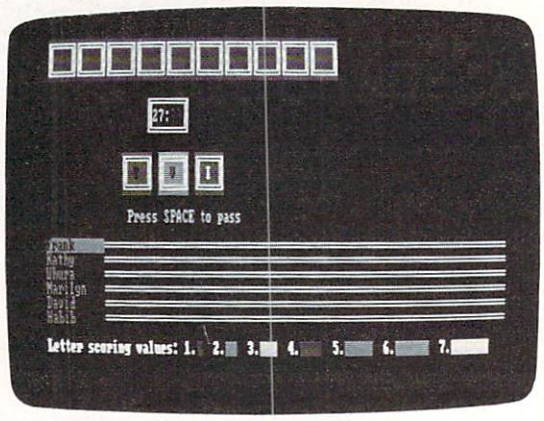
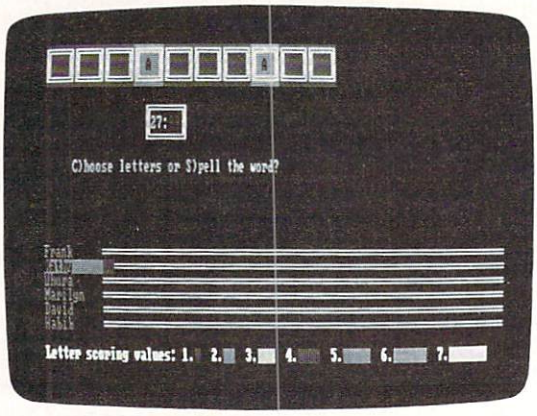


Figure 3: After a player makes a correct choice, the program shows the letter's position (or positions) within the word.



Choosing a letter that already appears in the word counts as an incorrect choice. This has important implications for strategy. If the three letters you have to pick from include a letter that's already been correctly chosen, remember that the program displays two letters at random. One of the other letters may or may not be a letter in the word, so you're taking your chances if you pick one of them. If you don't want to risk picking an incorrect letter and lose points, you can skip your turn by pressing the space bar.

As long as you continue guessing letters correctly, your turn continues. But when you miss a letter, pass with the space bar, or run out of time, it's the next player's turn.

Eventually, enough correct letters are filled in to encourage a player to guess the word. To spell the word, enter *only the missing letters*. If the word is correct, you gain points; if you guess wrong, you lose points. You earn a higher bonus for guessing a word that has relatively few letters filled in.

The game ends when a player's blue fuel gauge stretches all the way across the screen. You then have the option of playing another game (with different players, if you wish) or returning to DOS.

Customized Word Lists

The 3000-word file supplied on the magazine disk is sufficient for most purposes, but you may want to create your own word list for some reason. Perhaps you're a parent or teacher who wants to drill a child or student on a list of spelling words or special terms. Or maybe you want to use Wrimage as a party game, and you'd like to prepare a list of special words related to the occasion for the party. Wrimage is specially designed to make this easy to do, and absolutely no programming skills are required.

A Wrimage word list is simply a text file adhering to these five rules:

1. The text file must be saved on disk in ASCII format. ASCII stands for American Standard Code for Information Interchange and simply means a plain text file with no special word processing codes. Almost all word processors and text editors have an option for saving files in ASCII format. Consult your word processor manual for details.
2. The text file must consist of one word per line, each line terminated with a carriage return. Just type each word and press Enter/Return.
3. A word list must contain at least 20 words.
4. Words in the list may not contain spaces or numeric characters. Only the alphabetic characters *A–Z* are permitted. Both uppercase and lowercase letters are allowed.
5. Words must be from 4 to 12 letters long. Words shorter than 4 letters or longer than 12 letters are flagged as errors when the program loads the word list. Wrimage then gives you the option of aborting the program or starting the game. If you start the game, the words which triggered the errors are ignored.

To prepare a customized word list, then, simply type the words into your favorite word processor or text editor and save the file in ASCII format. You can use any filename. It's probably a good idea to use a different filename than WRIMAGE.LST, though, because you might accidentally erase the existing WRIMAGE.LST file if it's in the same directory.

Be extra careful when entering your words to verify the spelling. Nothing is more frustrating for a Wrimage player than to encounter a misspelled word in the middle of a game. (The word list on the magazine disk, incidentally, has been carefully checked. You'll discover that many of the words on the hard level are quite bizarre, but be assured they *are* valid words.)

Loading A Custom List

To play a game of Wrimage with the customized word list, run the program from DOS with this command:

WRIMAGE *filename.ext*

where *filename.ext* is the filename you assigned to your word list. Wrimage automatically loads your list when it runs.

Be sure your word-list file is in the same directory as WRIMAGE.EXE. If the program can't find the filename you specify, it tries to load the regular word list, WRIMAGE.LST. If it can't find that file in the current directory, you'll get an error message.

You'll also see error messages if the program detects any illegal words in your list—that is, words too short or too long, or words which contain invalid characters. As mentioned above, you have a choice of continuing on to the game or aborting so you can correct the list. (Note: Some word processors put an end-of-file character at the end of ASCII files which may trigger an error. This error can be safely ignored.)

Note that when a custom word list is loaded, the program won't ask you to choose a difficulty level, since the levels apply only to the standard word list. If you want to create your own levels, sort your words into different files according to their difficulty. You might want to assign them different filenames, such as EASY.LST, MEDIUM.LST, HARD.LST, and so on.

Important: Do not attempt to modify the regular word list, WRIMAGE.LST, by either adding or deleting words. The program expects the list to be in its present format to correctly assign the words to the various difficulty levels. **PC**

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Keyboard Lock-Out

Paul W. Carlson

Maybe you've got nosy coworkers, and you'd like to walk away from your computer for a moment without leaving important information on the screen. Or maybe your computer is at home, unattended during the day, and you're afraid your toddler might be tempted to press a key that would accidentally destroy valuable data. This security program—instantly available with a keystroke—is the solution. It works on any IBM PC, XT, AT, or compatible with DOS 2.0 or higher.

If you've ever had to leave your computer with sensitive information on the screen, or if you've ever wished you could put a program on hold in order to do something else, without fear of someone interfering with your program, this article is for you.

It never fails—when you're busy working on a computer, interruptions seem to occur at the worst possible times. What's needed is a "hold button" for your computer so you can deal with interruptions. In some situations, simply pressing the Ctrl and Num Lock keys simultaneously will do the trick. However, programs paused this way will be restarted when any key is pressed. Also, you may have something on the screen you don't want others to see.

To be effective in all situations, the computer's hold button should do three things: first, clear the screen; second, let others know the computer is in use; and third, minimize the possibility of anyone (like an inquisitive three-year-old) accidentally taking the computer off hold. "Lock-Out" does all this, and it's always available when you need it.

You'll find two files on the magazine disk for Lock-Out. LOCKOUT.COM is the actual program, a machine language file that's ready to install in your system. LOCKOUT.BAS is a BASIC program that, when executed, creates the LOCKOUT.COM file on disk. Even though we've already provided LOCKOUT.COM on the disk, we've also included LOCKOUT.BAS, so you can customize the program, as we'll describe in a moment.

Ready And Waiting

Lock-Out is always available for use because it installs itself as a memory-resident program, also known as a *terminate-and-stay-resident* (TSR) utility. Like other memory-resident programs, it needs to be run only once after the computer is switched on or reset; then, it quietly waits to be activated by a specific combination of keypresses. Another combination deactivates it until you need it again.

To install Lock-Out in memory, simply type LOCKOUT at the DOS prompt. (Make sure the file LOCKOUT.COM is on the disk in the current drive.) The prompt disappears for about a second, then reappears. Although nothing else seems to happen, Lock-Out is hovering in the background, ready to be activated.

Normally, the keys that activate Lock-Out are the Alt and L keys. When you press Alt-L simultaneously, Lock-Out clears the screen and displays the flashing message *COMPUTER IN USE*, so no one will think the machine is idle and turn it off. To unlock the computer, press Alt-L again. Lock-Out is deactivated until you need it the next time. Lock-Out remains in memory until you turn off or reset the computer.

While Lock-Out is active, any keys that are pressed, other than Alt-L, will have no effect. It works in both text and graphics modes, it works while you're running other programs (except those that take total control of the keyboard), and it even works while a text or graphics display is rapidly changing on the screen. When Lock-Out is deactivated, it restores your screen exactly as it was before, and your application program continues as if it nothing had happened.

(Note: When Lock-Out restores a graphics screen that has a colored background, occasionally the background color may change.)

Customizing Lock-Out

The special key combination that activates a memory-resident program is called the *hot key*. Occasionally, a problem arises when another program—either an application or another memory-resident utility—uses the

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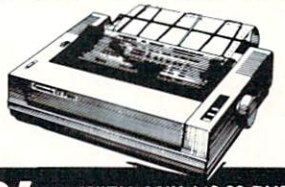

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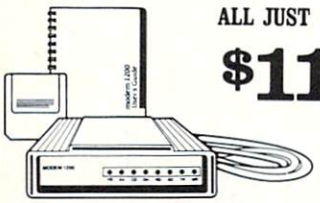

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same hot key for some purpose. If you happen to have, say, a memory-resident notepad that also is activated with Alt-L, the results are likely to be unfortunate when both the notepad and Lock-Out try to seize control of the screen and keyboard at the same time.

That's why we've provided a way to customize Lock-Out so it can be activated with any hot key you choose. To do this, you have to modify the file LOCKOUT.BAS—the BASIC program mentioned earlier. When you run LOCKOUT.BAS, it creates a new version of LOCKOUT.COM on disk that answers to your chosen hot key.

To begin, run BASIC and load LOCKOUT.BAS. When you type LIST 30, you should see this program line:

```
30 PRINT#1,CHR$(38);
```

The number inside the parentheses is the *extended scan code* of the key which, when pressed with Alt, will trigger Lock-Out. The current number is 38, the extended scan code for the Alt-L combination. You can change this number to the extended scan code for some other Alt-letter combination as shown in the following table:

30	Alt-A
48	Alt-B
46	Alt-C
32	Alt-D
18	Alt-E
33	Alt-F
34	Alt-G
35	Alt-H
23	Alt-I
36	Alt-J
37	Alt-K
38	Alt-L
50	Alt-M
49	Alt-N
24	Alt-O
25	Alt-P
16	Alt-Q
19	Alt-R
31	Alt-S
20	Alt-T
22	Alt-U
47	Alt-V
17	Alt-W
45	Alt-X
21	Alt-Y
44	Alt-Z

For example, let's say you want to activate Lock-Out with the hot key Alt-F (for "freeze"). Referring to the chart, simply change line 30 in LOCKOUT.BAS like this:

```
30 PRINT#1,CHR$(33);
```

(Be sure to press the Enter key on the program line after making the change.)

Now type RUN. The BASIC program will create a file on the current drive named LOCKOUT.COM. (If the disk in the current drive contains the regular version of LOCKOUT.COM, it will be replaced.) To install your customized version of Lock-Out, reboot or reset the computer and type LOCKOUT at the DOS prompt, as described above.

Automatic Installation

Memory-resident utilities such as Lock-Out are so handy, it's often desirable to have them available every time you use the computer. This is easily done by including them in your AUTOEXEC.BAT file to save yourself the trouble of installing them manually.

To make Lock-Out install itself automatically whenever you boot up or reset the computer, simply include the command LOCKOUT as a separate line in your AUTOEXEC.BAT file. If you aren't familiar with AUTOEXEC.BAT files, see the article "Getting Started with Batch Files" elsewhere in this issue, or consult your DOS manual.

There's one precaution to observe before using Lock-Out. The MS-DOS operating system used by IBM PCs and compatibles was not really designed with memory-resident programs in mind. These programs rely on programming tricks to install themselves in memory and respond to hot keys. Because of this, there are sometimes conflicts between memory-resident utilities and application programs, or between two or more memory-resident utilities that are installed simultaneously.

To avoid problems, you should test Lock-Out on your system with your application software and other memory-resident utilities before doing any important work. It's a wise idea to take this precaution when using any new memory-resident program on your system for the first time. **PC**

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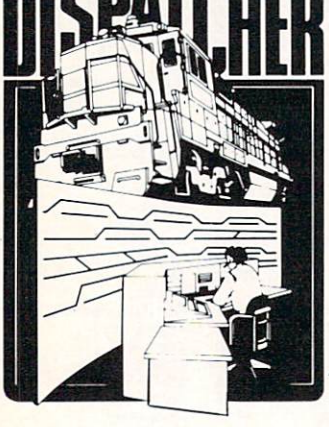

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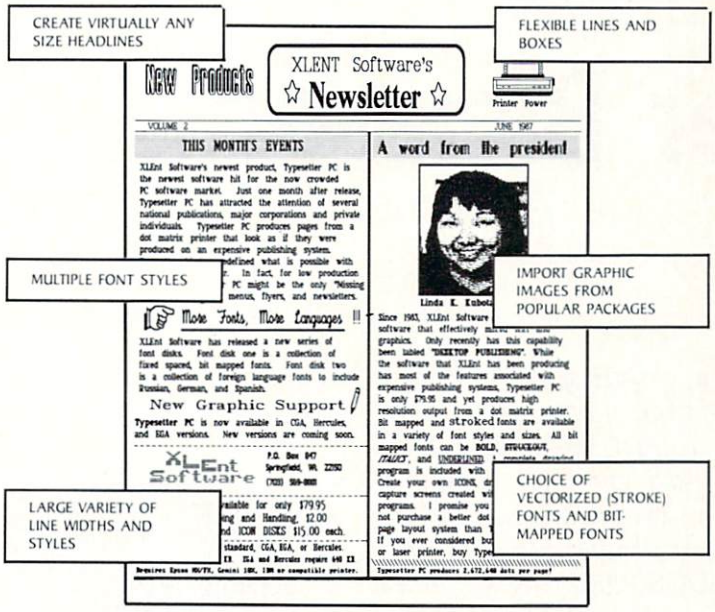
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Burger Blaster

Scott Ramsay

Here's a fast-paced arcade-style game with a surrealistic twist. Hamburger parts are flying through the air, and you must shoot them down in the correct order to make complete hamburgers and score points. The program works on any IBM PC, PCjr, XT, AT, or compatible with at least 256K of memory, DOS 2.0 or higher, and a color/graphics adapter or equivalent hardware. It won't run on monochrome systems.

It's far into the future, and centralization, automation, and mass merchandising have reached new heights. The giant fast-food chains now make all of their hamburgers in a central factory in the Asteroid Belt and ship them ready-made to the farthest corners of the solar system. Millions of hamburgers an hour are sent to Earth, the Moon, Mars, Jupiter, and the new colony on Pluto. The right to a daily burger is an important part of the Pan-Planetary Constitution.

But even in the 23rd century, Murphy's law holds true; something could go wrong—so it did. The artificially intelligent Cyburger-XMP computer that makes the hamburgers has gone genuinely berserk, and nobody can do anything to stop it. Hamburger parts are flying through space at near-light speeds, posing a serious threat to interplanetary navigation. Here a beef patty, there a tomato, and everywhere the halves of buns. There's even an occasional aerial hotdog.

How can the people of the planets be fed their daily burger under such circumstances? The Federal Department of Nonpassive Resistance has a solution: The army, using laser guns, will shoot down the hamburger parts in the correct order and collect them into a special tray. First they'll shoot the lower half of a bun, then the patty, then the lettuce, maybe a tomato, and finally, the top bun. A crazy scheme, to be sure, but the government thinks it will work.

Figure 1: The opening screen in "Burger Blaster" identifies your targets.

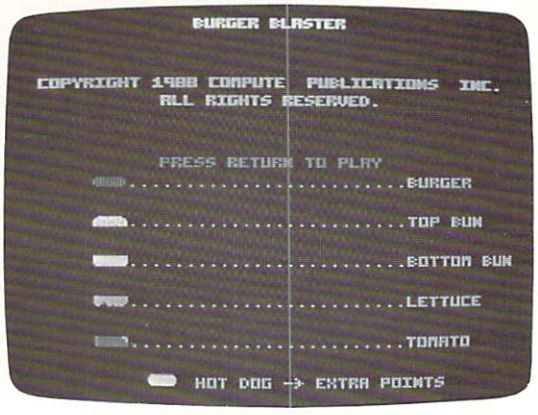
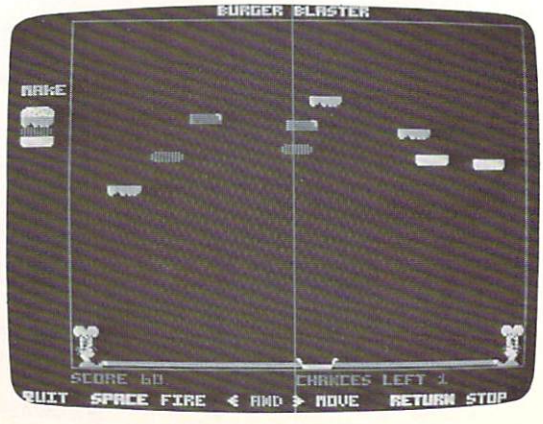


Figure 2: Hamburger parts fly across the screen as the player tries to build the burger shown in the upper left corner.



Beginning The Game

You can participate in this mission with "Burger Blaster," an arcade-style action game on this issue's magazine disk. You can run the game from the disk menu program or from DOS. To run it from DOS, just type BURGER at the DOS prompt. Remember that Burger Blaster requires at least 256K of memory, DOS 2.0 or higher, and a color/graphics adapter or equivalent built-in hardware.

Before running Burger Blaster, we recommend making a backup copy on another disk. Copy the data file BURGER.SHP as well as the program file BURGER.COM. (The data file defines the graphics shapes.)

A related file on the magazine disk is BURGER .PAS. This file isn't required to run Burger Blaster; it's the *Turbo Pascal* source code for programmers who are interested in studying how the program works. It is not an executable program.

When you run Burger Blaster, an opening screen shows what the hamburger parts look like. (See Figure 1.) Press Return to reach the game screen.

At the upper left corner of the game screen, you'll see a picture of a completed hamburger. (Figure 2.) This defines the type of burger you must build in the current round. The object of the game is to shoot down the flying hamburger parts in the proper order to build this burger. The fewer mistakes you make, the more points you score.

For instance, in the opening round, you must first shoot down the bottom bun, then the beef patty, and finally the top bun. If you successfully complete this round, you progress to a more difficult one with a bigger burger to construct—possibly with lettuce, tomatoes, and additional beef patties. Be careful not to shoot a piece that doesn't belong on the hamburger, or else you'll lose a life.

Keyboard Controls

At the bottom of the screen is the laser tray you use to fire shots and catch the falling hamburger parts. Press the left- and right-arrow keys to move the laser tray left or right along the bottom of the screen. The Return key stops the tray from moving. Press the spacebar to fire the laser. The Q key lets you quit a game in progress.

Each time you shoot a burger part, it drops straight down toward the bottom of the screen. You must catch the part to add it to your burger. If you shoot down a piece out of order, shoot a piece you can't use, or fail to catch a falling piece, you lose one life. After five mistakes, the game is over. Press the spacebar to play another game, or press Q to quit to DOS.

Sometimes, you'll notice, the berserk burger computer ejects hotdogs. You can shoot them for extra points. You can also earn more points by shooting the faster-moving burger parts. **PC**

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Author's Guide

Most of the following suggestions serve to improve the speed and accuracy of publication. We are much more concerned with the content of an article than with its style, but articles should be clear and well-explained. The guidelines below will permit your good ideas and programs to be more easily edited and published.

1. The upper left corner of the first page of your article should contain your name, address, daytime telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page: the language in which your program was written and the maker of that language, if applicable (for example, if your program was written in C, which compiler was used); the size, in kilobytes, of both your source code and executable object code; and any special requirements for your program (memory size, color or monochrome display card, hard disk, printer, modem, and so on).

3. The underlined title of the article should be placed about ⅔ of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number—for example: Memory Map / Smith / 2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not right-justify. Leave the lines ragged.

6. Please use standard typing paper (no erasable, onionskin, or other thin paper), and type on one side of the paper only (upper- and lowercase).

7. Sheets should be attached with a paper clip, not stapled.

8. If you are submitting more than one article, send each one in a separate mailer with its own disk.

9. Short programs (under 20 lines) can be included within the text. Longer programs should be stored twice on disk and submitted with the article. For compiled programs or machine language, include the executable object code, source code, and any files needed to recompile the program. Compiled object code must be a self-standing runtime file that can be used by readers who do not own a copy of the language in which the program was written. In addition, we must be able to legally distribute the runtime code without incurring licensing fees or other obligations to the maker of the language. Check with the maker if you aren't sure about licensing fees. If your article was written with a word processor, we also appreciate a copy of the ASCII text file on the disk. The disk should be labeled with both your name and the title of the article. For their safety, disks should be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. For greater clarity, use all capitals when referring to language commands (LIST, RND, GOTO, CASE OF) and languages which are acronyms (such as BASIC, PILOT, and FORTRAN, but not Forth, Pascal, or Logo). Headlines and subheads should, however, be initial caps only. Do not capitalize words for emphasis; instead, underline words you wish to emphasize, thus indicating *italics.*

11. Articles can be of any length—from a single-line routine to a multiple-issue series. The average article is four to eight double-spaced, typed pages.

12. If you want to include photographs, they should be either color slides or 5 × 7 black-and-white glossies.

13. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

14. COMPUTE!'s PC Magazine pays between $200 and $2,000 for published program articles. Payment is made upon acceptance. Following submission (to Submissions Reviewer, COMPUTE!'s PC Magazine, P.O. Box 5406, Greensboro, NC 27403), allow four to eight weeks for a reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned only to authors who enclose a self-addressed, stamped envelope.*

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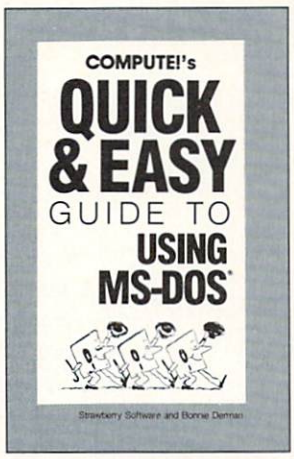

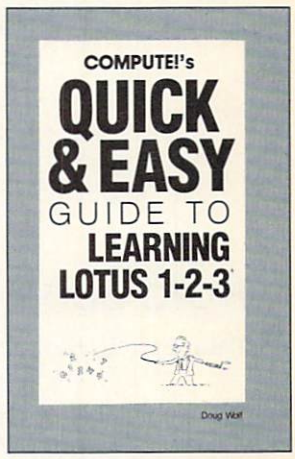

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Nota Bene

Keith Ferrell, Features Editor

System requirements: Any IBM PC, XT, AT, Personal System/2, or compatible with at least 256K of RAM (384K required for concurrent Text-Base operations); 640K of RAM and a hard disk are recommended.

If you're one of those people who looks at cost before reading a software review, don't be disheartened by *Nota Bene*'s price. Not only is this program worth every penny Dragonfly charges, it's a bargain—and it would be at an even steeper price.

Admittedly, the range of prices for application software raises some questions. Since you can now buy powerful word processing software for under $100, why should you spend five or six times that much? What makes one word processor worth more than another?

One obvious answer is features. For more money you expect more conveniences. A more complex program may require more time to learn, but once mastered, it will let you fly through your text, simplifying both entry and editing. *Nota Bene* meets these criteria, and then some.

Documentation is another answer. If you're making an investment, rather than just a purchase, you should expect a thorough manual and accessible technical support. *Nota Bene*'s manual contains close to a thousand loose-leaf pages which answer questions I doubt I would ever have thought of. And a contextual help-screen system within the program is far more helpful than most such screens in other programs.

A less obvious answer is *customization to particular needs*. It's one thing to process text and then format it to meet stylistic or professional requirements. It's quite another thing to encounter a word processor that addresses some standard style sheets and comes with those sheets built-in. *Nota Bene* includes the *Chicago Manual of Style*, the style manual of the American Psychological Association, Turabian's style guide for academic papers, as well as generic style manuals. You can even customize a style manual to suit your own preferences.

Some programs so thoroughly address all of the possible applications that it's clear from the moment they're installed that even a high price can be reasonable. *Nota Bene* is one of those programs. It is by a good measure the most powerful word processor I've used. *Nota Bene* accomplishes so many different things in so many different user-definable ways that it almost becomes an extension of your personality.

You can be up and running with *Nota Bene* in a few minutes and still be discovering new features a few months later. In *Nota Bene*, Dragonfly has provided a full-featured word processor, a dynamic text-retrieval system, *and* a customized professional tool.

This is a *valuable* program.

The *XyWrite* Engine

Above all, a word processor has to be a useful tool for working with words. All of the add-on features in the world won't overcome an annoying interface or slow response to standard commands.

Nota Bene succeeds beautifully at its primary purpose: it's a fast, powerful, sophisticated word processor. This isn't surprising, because the engine within *Nota Bene* is the popular *XyWrite* word processor, licensed from XyQuest. But *Nota Bene* is much more than just an enhanced version of *XyWrite*. Dragonfly has taken an outstanding word processor and made it into something even more special.

Dragonfly has retained all of *XyWrite*'s much-vaunted speed and ease of use. *Nota Bene* is rich enough that even months of experimentation and customization won't exhaust all of its potential, yet beginners can be processing text within a few minutes of installation. And *Nota Bene* is *fast*. Searching and replacing are accomplished in seconds, even with long files.

The *Nota Bene* screen is simplicity itself. A command line across the top serves as an information panel and interface with the program. Below the command line, a ruler line separates you from a blank screen. Once you begin typing, hard carriage returns are indicated by a left-pointing arrow, although these can be hidden if you prefer. Formatting codes and special features are embedded in deltas—solid triangles that appear onscreen or can be suppressed. Beyond this, the appearance of your screen is determined by your decisions during installation.

Memory-Hungry

Installation is simple and takes less than an hour. Even this process hints of *Nota Bene*'s power. The installation program guides you through its stages easily and informatively. You configure the screen to suit your needs, setting attributes

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for boldface, italic, and footnotes. Italics, for example, appear on a monochrome monitor as underlined text. You get a choice of style manuals, as well as a generic format. There are dozens of printer drivers included with the program, and selecting one is as easy as scrolling through the choices until you find the one you want.

This much power requires a lot of memory. A minimum of 256K gets you started, but more memory is needed to fully take advantage of *Nota Bene*'s features. Because the *Nota Bene* program sits in memory rather than shuffling back and forth to disk—a process that slows many word processors to the point of intolerability—it is fast and works best with the full 640K of RAM addressable by DOS.

Due to memory conflicts, you may find that some of your memory-resident programs don't work or crash when *Nota Bene* is up and running. To fix this, experiment with the order in which the resident programs are loaded. *Nota Bene* has a command which can be included in your AUTOEXEC.BAT file that allows resident programs to coexist comfortably with the word processor.

For those who wish to get started quickly, there's a good, thorough tutorial program that touches on many of the most commonly used functions of word processing, as well as offering glimpses of the power that resides beneath *Nota Bene*'s surface. By all means walk through the tutorial, but don't let the convenience of simply being able to process words with *Nota Bene* blind you to all the other things the program can do.

A Labor-Saving Manual

To discover those other features, you must turn to the manual. In fact, *Nota Bene*'s manual is probably the first thing you'll notice about the program. It's *heavy.* It is also thorough to the point of being exhaustive. What saves the manual from being exhausting as well is the care its writers took in dividing the book into subsections, each addressing a specific area. Each section is prefaced by a summary of operations that includes a keyboard diagram; the summaries are indispensable when approaching a new section.

The manual uses plenty of keyboard diagrams which are clearly labeled and reproduced. Indexing, as we'll see shortly, is one of *Nota Bene*'s great strengths; appropriately, the index to the manual is complete, with only a few idiosyncratic identifiers. When I needed clarification or help, the index guided me to my answers quickly.

(I'd note as well that the manual is literate without being stuffy. Examples illustrate the operations discussed, and many of the examples make interesting reading on their own. My favorite was a nod to the sadly underappreciated novelist Mervyn Peake.)

There is a great deal to learn in *Nota Bene,* but the manual takes a lot of the effort out of the learning process. You can concentrate on absorbing the information rather than finding or deciphering it, as is still the case with many other software manuals.

Sensible Command Structure

Nota Bene is command-driven, meaning that the Ctrl, Shift, and Alt keys get a real workout as you move through a document. No pull-down menus here. Again, though, Dragonfly has applied common sense as well as uncommon power to its command interface.

Ctrl-key commands work on words. In combination with the appropriate key, Ctrl moves the cursor to the beginning or end of a word, deletes the word, or defines it. There's a Ctrl-key command for transposing words as well.

Shift-key commands are reserved for sentence operations: deleting sentences, defining them, and transposing whole sentences.

Alt-key commands give you control over paragraphs. In addition, the combination of Ctrl–Shift lets you work with short sections or phrases of text. The command keys work on the same linguistic units in concert with the arrow, Home, and End keys. This is a sensible command-key structure that is easily assimilated and quickly becomes second nature.

Likewise, the program's use of function keys makes sense and is easily learned. The function key menu differs in some respects from that of *XyWrite;* for instance, *Nota Bene* doesn't offer the function keys onscreen as does *XyWrite.*

Basic function commands are easy to learn. The F5 key saves the document in progress; F1 both begins and ends a defined block, and the defined portion is highlighted on the screen. Pressing F9 gets you to the command line; F10 executes the command you enter; F8 returns you to the stopping point in your text. F6 gives you access to style manuals, layouts, contextual help, and more. F7 lets you open as many as nine windows. And so on.

A few minutes with the tutorial gives you the tools you need to start building documents. Deeper involvement with *Nota Bene* gives you more and more text-manipulation tools of many types.

Windows On Your Work

Access to multiple windows is one of those tools. *Nota Bene* doesn't restrict you to a couple of working documents at a time. With up to nine open windows, you can shuttle among all the various projects that even the most multitasking of writers could require. Opening and closing windows is a breeze; type a function key and the window number, and it's done. The windows menu tells you the amount of memory each open window occupies.

Typically, *Nota Bene* offers a variety of display formats for the windows. The screen can be bisected horizontally for page displays or vertically to let you compare columns. Or you can draw windows to any size you want.

Nota Bene's cut and paste func-

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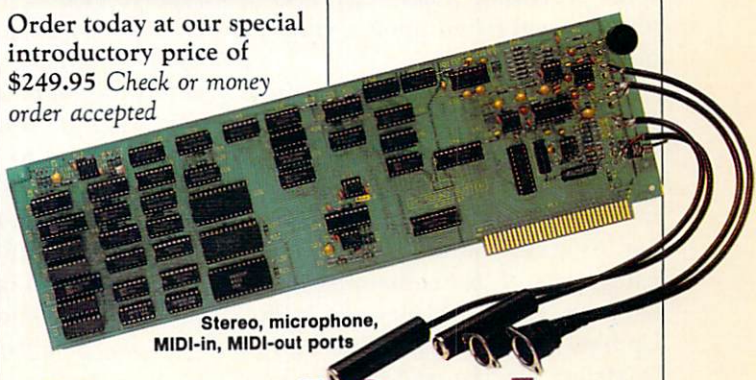

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tions are also simple to master. In fact, moving or copying a block is perhaps simpler here than on any word processor I've used. Simply define the block using F1, move the cursor to the destination, and type the numeric keypad's minus key to cut and move the block; press the keypad's plus key to copy the block. It works as well for moving text between windows as within a single document.

Macros have their own feel in *Nota Bene*. For one thing, the authors refer to them as *phrases*. *Nota Bene* lets you assign phrases to 35 different keys; the phrases are called up by pressing Alt and the assigned key. Phrases can be stored in libraries which can be overlaid, providing a near-infinite supply of tailored phrases for specialized purposes. Phrase libraries can hold up to 50,000 characters.

The Text-Base Feature

So far we've seen only a glimpse of *Nota Bene*'s word processing power, and we haven't even mentioned the program's other features. There are many, all impressive, but one that stands out is Text-Base. This feature is based on the program *FYI*, but takes on its own character within *Nota Bene*.

Put simply, Text-Base indexes your document, making possible not only rapid searches—*Nota Bene*, of course, has a more traditional search-and-replace function in its word processing mode—but also text retrieval based upon a variety of elements.

Text retrieval is determined by the number and nature of the keywords you select to retrieve. You can even use Boolean operators such as AND, OR, and NOT. For instance, you could retrieve paragraphs of text containing references to Norman Mailer and John Updike, but not those which refer to Mailer, Updike, and Saul Bellow.

Text-Base is a powerful tool. To invoke it, the text must first be indexed. This aspect of *Nota Bene* is menu-driven, with each step clearly delineated onscreen. Indexing takes some time, the manual notes; still, preparing 6000 words of text on my 80286-based system required only a couple of minutes. If your computer has enough memory, Text-Base can be run concurrently with word processing operations.

Essentially, Text-Base provides you with a hypertextual perspective on your work. It can be informative to view sections of text via their central ideas or concepts as revealed by key words with which they are expressed. Reviewing a manuscript with Text-Base can help you not only clarify your writing, but also sharpen the focus of your thinking.

Footnotes And Endnotes

Nota Bene is often cited as an academic word processor. But don't interpret this to mean that *Nota Bene* is stuffy or restrictive.

True, *Nota Bene* was put together with an academic market in mind. The presence of the style manuals is one example of this slant; others are the provisions for sophisticated outlining, footnotes, and endnotes. However, *Nota Bene* is not just an academic and technical word processor, although it certainly succeeds at that. The program might more appropriately be considered a professional tool for any application that is text-intensive.

Nota Bene has built-in format controls for footnotes and endnotes, insuring that those notes are printed in accordance with style-manual requirements. Considering how much time graduate students have spent using tab commands on other word processors to make their papers match a professor's expectations, it's hard to imagine anyone going to school without *Nota Bene*. And obviously, a sophisticated footnote/endnote capability also has applications in a number of offices and professions.

Even if you're not a student, the footnote capability is a means of augmenting your writing. When drafting a piece, sections may take sketchy form at first. Making a footnote at the appropriate point is just two keystrokes away with *Nota Bene*. The note is recorded, and all that remains in your text is its number. When you're ready to do whatever additional research or expansion is required, you can scan the manuscript for the notes made while hurrying through the early draft.

Nota Bene's outline processor is equally powerful. You can choose from three standard outline formats or two legal outline formats. Each entry and subentry is thereafter automatically numbered or, if additions or deletions are made, renumbered.

It almost goes without saying that *Nota Bene*'s capabilities extend to the generation of tables of contents, bibliographies, and indexes. As with all other aspects of this package, these functions can be adapted to your particular style requirements or needs.

Formatting And Printing

Nota Bene offers a variety of methods to prepare your work for printing. The program supports page layouts of virtually any type, from standard pages to snaking columns, tabular columns, flush center, cellular tables, and more. You can choose running headers and footers, footnote and endnote formats, and footnote separators. Formatting commands are easily mastered, and you can preview documents before printing.

You can build a library of standard formats and call them up as needed. *Nota Bene* even comes with several formats built-in, including memo, letter, and generic footnoted formats. It's a snap to set up your own formats and store them for future use.

The program supports laser printers and automatic leading (between-line spacing). You can print several documents from a queue, print one page at a time, print the file that's on the screen, or print the file to disk. With enough memory, you can print one or more files while working on another.

The printer instructions are clearly presented. I had no trouble

formatting a document to my specifications and then printing it without format problems—a first in my experience with word processors.

Still More Features—And Some Drawbacks

This review can't cover everything in detail, but here are some additional points to think about if you're considering *Nota Bene:*

- You can access DOS and even run other programs from within *Nota Bene*. When you're done, return to the document and pick up where you left off. I had no trouble running a telecommunications package to upload and download long files, while *Nota Bene* held my document file in memory.
- *Nota Bene* offers an extended keyboard that includes foreign-language characters, monetary symbols, and so on. This feature can be turned on accidentally via the Esc key, resulting in a line or two of odd symbols. Dragonfly is altering the access to the extended keyboard in forthcoming editions.
- There is no spelling checker or thesaurus in the current version of *Nota Bene*. (However, Dragonfly has announced an upgrade with spellchecking and thesaurus capabilities.) Considering the number of unprecedented features *Nota Bene* already offers, this might not be considered a major drawback, even at *Nota Bene*'s price. *Nota Bene* worked well with several off-the-shelf commercial spellers I tested.
- Paragraphs automatically reformat as you alter them. But inserting a letter in an italicized word does not automatically italicize the letter. This is one drawback I did find annoying.
- *Nota Bene* provides a programming language so you can further tailor the program to your own needs. This is an intriguing feature if you have the nerve to try it. Fortunately, *Nota Bene* isn't copy-protected, so you can experiment with altering a copy while keeping the original tucked safely away.

There's more, but the point is made. For academics, lawyers, and technical writers, *Nota Bene*'s value is obvious. I make my living working with words and consider *Nota Bene* the most valuable program I've ever seen. If words figure highly in your work, give some thought to investing in a professional tool whose designers understand word processors, computers, ideas, and how they come together.

Take note of *Nota Bene.*

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Personal Portfolio Manager is a complete securities-portfolio management tool. As the manual points out, this program is intended for managing investments once they are made—not for choosing which investments to make.

The program allows you to open several portfolios—one for each broker you use, for example—and to add new portfolios at later dates. You can enter cash transactions and options, add securities to your database, and keep track of other kinds of transactions, including sales and income/capital gain distributions. *Personal Portfolio Manager* accurately keeps track of all of your entries and makes the information quickly and easily available.

But this program is more than just a database manager for shuffling around your securities information. Its beauty and power comes from its ability to dial up an online database such as Warner Communications Systems or Dow Jones News/Retrieval, to download quotes for each security (current or historical), and to generate reports based on this data. All of this can be accomplished manually or automatically.

Another handy feature updates all quotes in the master securities file, so all of your individual portfolios are similarly kept up to date.

Portfolio Portraits

Personal Portfolio Manager can save you a lot of time just by automating tedious tasks. For instance, while testing the program, I needed to know the fair market value per share of securities held by a person who had recently passed away. The Internal Revenue Code defines fair market value as the mean average between the highest and lowest selling prices on the date of the person's death.

After entering all of the securities in a portfolio, I dialed up Warner (which keeps historical quotes) and watched *Personal Portfolio Manager* quickly download the highs and lows for that date. I then used the program's report feature to perform the necessary math. The report feature is powerful, allowing you to select information from a securities data record and then perform mathematical functions on the information. The mathematical operations are performed between or among columns of data, and the results are entered in another column. This function is so versatile that you can do things that aren't even listed in the manual.

In this case, it was necessary to average the highs and the lows of the various securities. Rather than compute them individually, I created a new column in the report and assigned it a value of 2. I then used the report feature to add the high column to the low column and divide by the new column. The result was the mean price of the securities for that date.

Personal Portfolio Manager performed all of these functions quickly and accurately. By contrast, I requested a stockbroker to supply me with the same information, and I'm still waiting.

Easy Installation

Installing *Personal Portfolio Manager* on your system is straightforward, thanks to the manual's good step-by-step instructions. When installing the program on a hard disk, you can choose any drive from C–Z. This is a worthwhile feature—too many programs assume all computers come with just one hard disk, drive C.

One curious exception to the easy installation is that, late in the process, you're required to copy certain files to your hard drive. It's odd that this procedure wasn't automated like most of the others.

Entering START at the DOS prompt begins the program in manual mode, while STARTAUTO initiates an automatic mode that goes online, updates quotes, prints reports, and returns to DOS.

Personal Portfolio Manager is a little bit tricky to get up and running, and the manual is a bit weak in this area. It does come with a demonstration portfolio from which you can learn a lot, but remember to delete it before entering real information. Otherwise you'll have to work around or put up with the demonstration securities where you don't want them.

The manual is also not clear on how to define reports—I found the instructions confusing. Fortunately, the examples in the back of the manual are a saving grace. It turns out that defining a report is quick, simple, and easy, once you get the hang of it. The best way to learn is to define a report while reading the instructions *and* referring to the examples.

Once you have defined a report or have picked a predefined report, you're ready to go online and watch this efficient program do its stuff.

Online Operations

For updating quotes by telephone, you'll have to sign up with a financial service such as Warner's or Dow Jones, of course. If you try Warner's, as I did, beware of conflicting advice. Upon signing up, Warner's assigns you an account number and a password. When logging onto their data retrieval service, Warner's may tell you to use your password. Customer support at Abacus may tell you to use your account number. *Personal Portfolio Manager*'s manual tells you to use your account number, a hyphen, and your password. All three are

wrong. Use your account number, followed by a space, followed by your password.

In auto mode, *Personal Portfolio Manager* can log onto the service, retrieve the information you need, log off, and present you with a finished report—all with little or no intervention on your part. This is a boon for busy business people as well as small-volume investors who need to keep their online costs down.

Personal Portfolio Manager has some additional features to make life easier, including a pop-up calculator that's available at certain times and a function key menu that changes depending on the operation you're performing.

The program is a bit quirky in some of its keystrokes and in its security editing procedures, but the quirks are easy to assimilate. Once you become familiar with the program, it's very smooth to operate.

Overall, if you need to track more than just a few securities, *Personal Portfolio Manager* is such a powerful, complete, easy-to-use management tool that you'll wonder how you got along without it.

Personal Portfolio Manager
Abacus
P.O. Box 7219
Grand Rapids, MI 49510
$150

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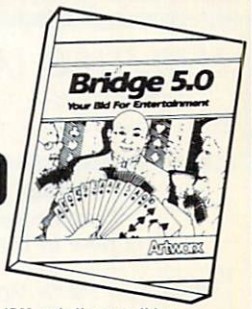

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Sub Battle

Ed Ferrell

System requirements: IBM PC, XT, AT, or compatible with at least 128K of memory and a color/graphics adapter (CGA) or equivalent hardware. Latest version (untested) also works with the enhanced graphics adapter (EGA) and Hercules graphics adapter (HGC).

You received your orders six hours ago and your Tench Class submarine now cruises calm waters at 15 knots, bound for Java, where you're to patrol the western shore until receiving further orders. It's 30 hours to Java. Just when you figure you might get an hour or two of shuteye, you hear that now-too-familiar cry: "Battle stations, battle stations!"

The crew takes position, and the antiaircraft gun is unlimbered. You must draw a bead on the Zero diving in for a bombing run—and do it fast. Bomb damage is not the best way to start a mission in *Sub Battle*.

After two bombs narrowly miss your sub, the Zero is brought down with several bursts of antiaircraft fire. Your crew whoops and cheers, but you barely crack a smile. You're the captain, and you know that a Zero means an enemy convoy is nearby. The whole crew depends on you for their lives, and the folks back home are counting on you, too. It's time to unroll the charts and try to outguess the enemy.

One of the lookouts spots smoke on the horizon. For you and your sub, that means battle stations again. You're ready for anything.

Choose Your Vessel

Sub Battle is the first release in Epyx's new Master's Collection, and it puts you in command of a World War II submarine. You can choose to command either an American sub or a German U-boat, and you can pick any year of the war, from 1939 to 1945. Both the Allies and the Germans made improvements to their subs and torpedoes during the war, and these improvements are reflected in the year you pick. Later-model subs offer more torpedos, sonar, greater fuel capacity, and other features. The submarine you command in 1944 is quite different from the one used at the beginning of the war.

In addition to picking a year, you can also choose from more than 60 different missions. It could be a short ten-day patrol off the coast of Java to help rescue downed bomber pilots, or a hazardous venture into an enemy harbor to lay mines. If you command a U-boat, chances are you'll lie in wait for merchant ships near busy British shipping lanes.

None of the missions is easy. Even a seemingly simple assignment such as cruising to Corregidor to land a shore party with supplies demands sharp and constant vigilance. Enemy ships and planes could be anywhere.

When embarking on your mission, you must set your course and speed to reach the destination in the most efficient manner. To help with navigation, the program offers map views ranging from 7 miles across to 2000 miles. Using the largest map view, your first objective is to steer your sub by controlling speed and heading and reach the longitude and latitude indicated in the mission briefing.

The duration of long voyages can be reduced with a time-compression feature. This allows you to toggle from realtime—where one second of actual time equals one second of game time—to a ratio in which one second of actual time equals four hours of game time. Once on station, you can continue using time compression while waiting for the enemy. The radar and sonar views help you spot enemy activity.

Stalking Enemy Ships

When you have the enemy in visual range, *Sub Battle* rewards you with some admirable graphics.

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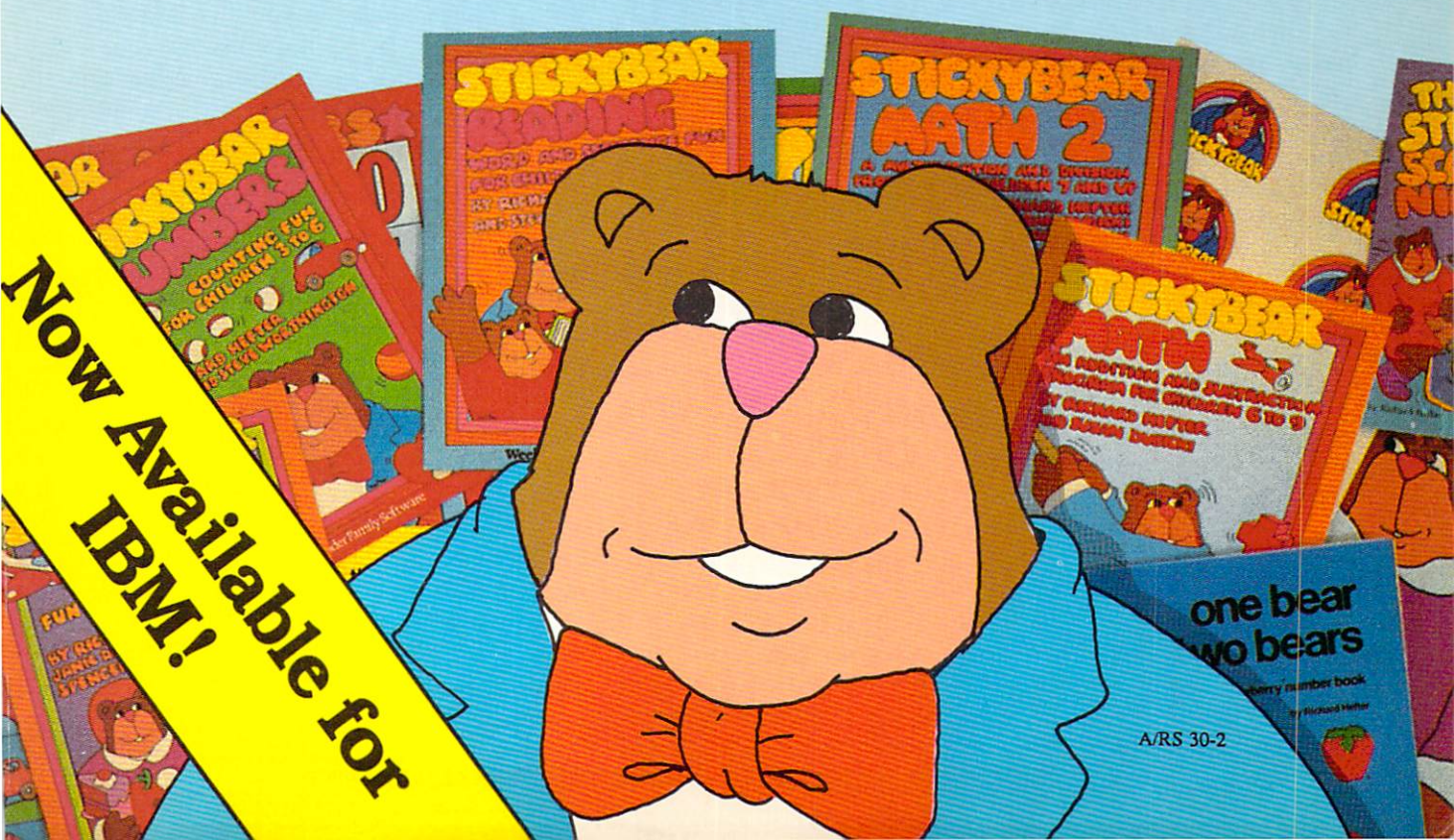
These and other Weekly Reader Family Software programs are available for use on IBM-PC/XT/AT and compatibles (EGA, CGA or equivalent required). Look for the complete line of Weekly Reader Family Software programs for pre-school through junior high children in finer computer stores everywhere. Or call toll free 800 327-1473 (in Connecticut, call (203) 542-5553).



A/RS 30-2

There are battleships, aircraft carriers, destroyers, merchantmen, escorts, transports, tankers, and patrol boats. And in the air, you're likely to spot Aichi seaplanes, Zeros, Grumman Avengers, or Catalina PBYs—depending, of course, on the color of your uniform.

Once the enemy is spotted, you can toggle from a conning tower view to a 7× binocular view—or if submerged, to the periscope view. When you're close enough, the ship type and range flashes across your message board. But you'll soon learn that when you can see the enemy, most likely they can see you, too.

Despite the fact that submarines can dive and hide, they're really very fragile crafts, especially when on the surface. The main guns of a small patrol boat or destroyer, not to mention depth charges and aerial bombs, can easily cripple or destroy your sub. Enemy fire can damage your deck guns or torpedo tubes, dive planes, rudder, pressure hull, battery, and more. Each component must be in good order for your submarine to work at peak effectiveness.

When something is damaged, repair requires time—time you don't have while under attack. You can dive and wait until the convoy passes and repairs are made, but you'd better be sure the batteries are fully charged. It can be a long wait before enemy ships give up the opportunity to sink an enemy submarine.

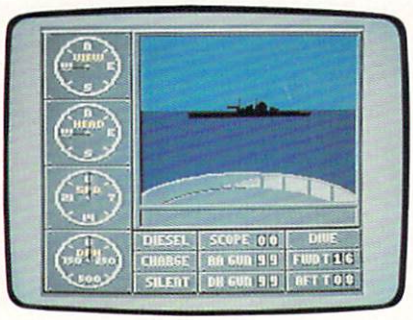
Taking The Offense

Attacking enemy ships isn't easy, either. Rising to periscope depth, you center your target and fire the forward torpedo tubes (aft tubes are available in later years of the war). Once launched, torpedos streak toward the enemy target until they either hit or you see the disappointing message, "Torpedo has stopped running, sir!"

Real-life frustrations are accurately recreated in *Sub Battle*. For instance, there's always the chance that your torpedo will score a direct hit on an aircraft carrier, only to be revealed as a dud. And if your first shots miss and you want to try another, don't forget that enemy lookouts have probably spotted the torpedo trails and it takes time to reload your tubes.

In 1939, your submarine is equipped with only eight torpedoes, so a successful 20-day mission might consist of firing at two carefully chosen targets in a convoy, submerging until the enemy passes, and then seeking to surprise another enemy convoy.

You'll also discover that only rarely can a submarine successfully slug it out with warships. The major factor in your favor is surprise, not firepower.



The Real War

The reality of ocean combat seems to be the main criteria for scoring each mission of *Sub Battle*. If your submarine is destroyed, you lose your command and must pick another mission. If you survive the mission, your score is based on ships and planes sighted and sunk, rounds fired, days on station, and so on.

Sub Battle can be played on an individual mission basis or, when you feel ready, you can try your hand at a War Command. In this mode, you begin early in the war and progress with each successful mission. As the years pass, the nature of the war changes, and the submarines to which you are assigned acquire new characteristics. Since this takes hours, games can be saved and reloaded for later play.

There are four difficulty levels in *Sub Battle* and certain functions are enabled only on certain levels. For instance, at the lower levels, a navigator is available to quickly move your sub to its destination. At the highest levels, the navigator is absent; you must rely on your own navigational skills. The time required to repair damage escalates as the level of play increases, and features like weather effects and sea conditions exercise more influence in the higher levels. The map view doesn't show enemy ships and planes in levels three and four, and the overall ability of the enemy increases with each level.

Sub Battle comes with a well-illustrated booklet and quick reference card of commands. The manual explains the different specifications of both the American and German submarines as well as a good, if brief, chapter offering historical perspective on submarine warfare.

In sum, *Sub Battle* is a detailed simulation that captures the flavor of World War II submarine combat. You fire your torpedoes and deck weapons with satisfying arcade-type actions, while each mission also tests your strategic and tactical abilities. If you're successful, you'll learn a great deal about surprising your enemy, exercising patience, and knowing when it's necessary to cut your losses as you dive and hide.

It's a delicate balance, but with practice you can become the kind of sub captain of which legends are made.

Sub Battle
Epyx
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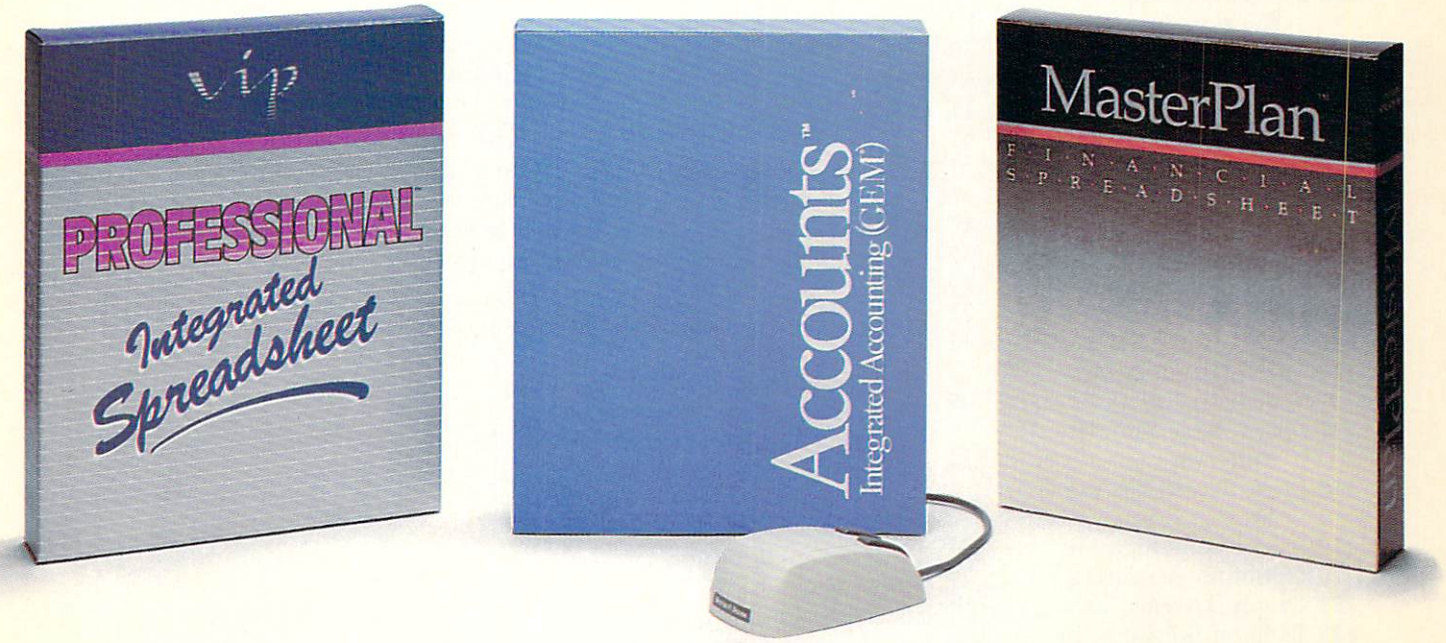

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HOW TO USE THE DISK

Every issue of COMPUTE!'s PC Magazine includes a 5¼- or 3½-inch disk as part of the package (newsstand copies contain 5¼-inch disks only; subscribers get their choice). If you experience a problem with the disk, please contact us at (919) 275-9809 from 8:30 a.m. to 4:30 p.m. Eastern time, Monday through Friday.

Before you begin using the magazine disk, we highly recommend making a backup copy and keeping the original in a safe place. Follow these instructions:

Computers with two floppy disk drives: Put your working copy of DOS in drive A and enter DISKCOPY A: B: at the DOS prompt. When DOS prompts you, remove the DOS disk from drive A and replace it with the magazine disk. Put a blank disk in drive B and press any key to make the copy. If the blank disk was not previously formatted, DISKCOPY formats it for you.

Computers with hard disk drives: Put the magazine disk in drive A and enter COPY A:*.* C:*directory* (substituting your own directory name for *directory*). You can specify any directory of your choice, but it must already exist on the hard disk. For instructions on creating directories, see your DOS manual.

Computers with one floppy disk drive: Put your DOS disk in the drive and enter DISKCOPY. Then follow the instructions on the screen.

Running Magazine Programs

Important: Previous magazine disks had a special menu program which displayed descriptions for each file and allowed you to run some programs directly from the menu. To save disk space and reduce confusion, the menu program has been replaced with a README file. This file contains the same kind of descriptions as the old disk menu.

You can display the README file on the screen by entering TYPE README at the DOS prompt. (You can also type RUN or DISKMENU.) Hold down the Ctrl key and press NumLock to pause scrolling; press any other key to resume it. (Some compatibles have a special Pause key for this purpose.) You can read the README file more easily by loading it into your word processor, or by printing it with the DOS command COPY README LPT1.

To run the magazine programs, follow the instructions in the corresponding magazine articles. Remember that some files on the magazine disk are not executable programs—for instance, some files contain source code for programs included elsewhere on the disk in compiled, executable form. *Please consult the articles for instructions before running the programs.*

Programs That Require DOS

Some programs on PCs and compatibles require COMMAND.COM (a DOS file) to operate. Floppy drive systems look for COMMAND.COM on drive A, so it's best to keep a disk with COMMAND.COM in drive A. If there's room on your backup copy of the magazine disk, you can copy COMMAND.COM onto it and run the magazine programs from drive A. If there isn't room, put a COMMAND.COM disk in drive A and the backup copy of the magazine disk in drive B. Then run the magazine programs from drive B.

If the system you're using has one floppy drive and no hard drive, copy COMMAND.COM onto your backup disk if there is room. If there isn't room, copy some of the programs you want to use from your backup disk to a disk with COMMAND.COM. Then run the programs from this disk.

If the system you're using boots from a hard drive, the computer can find COMMAND.COM on the hard drive. If you boot a hard drive system from a floppy disk in drive A, you should keep a COMMAND.COM disk in drive A.

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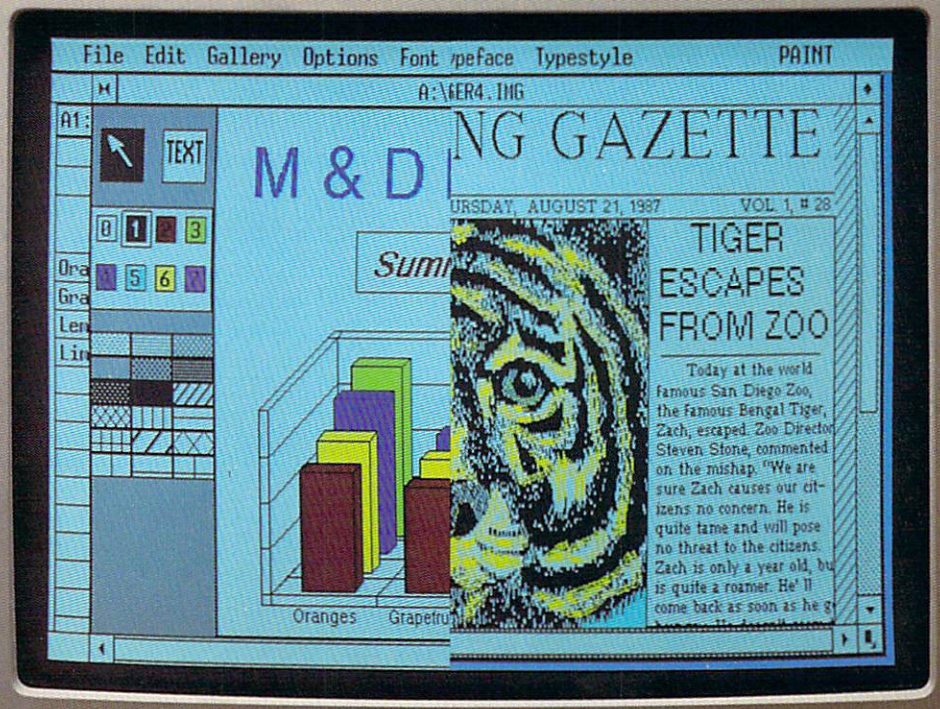
A computer for the left brain. And the right.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Today at the world famous San Diego Zoo, the famous Bengal Tiger, Zach, escaped. Zoo Director Steven Stone, commented on the mishap. "We are sure Zach causes our citizens no concern. He is quite tame and will pose no threat to the citizens. Zach is only a year old, bu is quite a roamer. He' ll come back as soon as he g
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Until now, choosing a computer typically meant choosing between capabilities. If you needed a computer primarily for serious business needs, then a computer with IBM compatibility was the only rational (left brain) choice, right?

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*Source: International Data Corp.

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Quest of the Avatar

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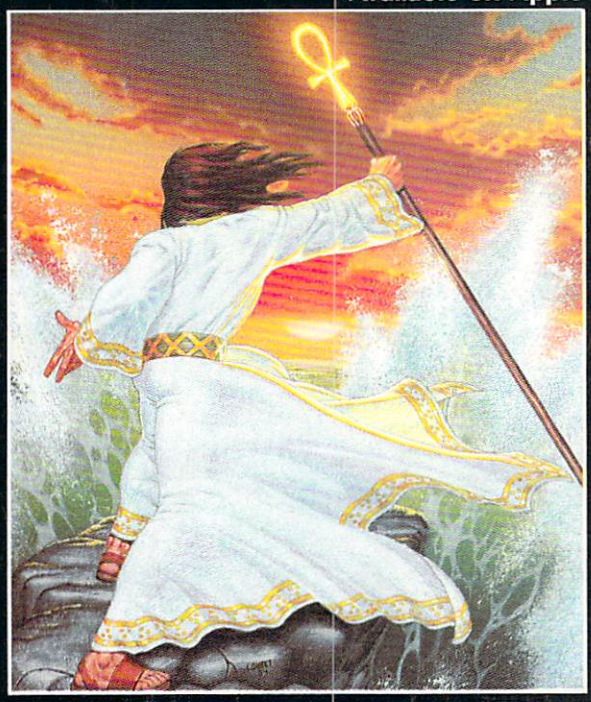


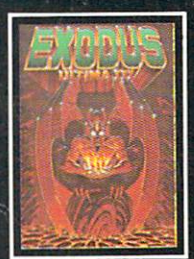
A state-of-the-art fantasy role-playing game of unprecedented magnitude by Lord British™.

Prepare yourself for a grand adventure: Ultima™ IV, sixteen times larger than Ultima III, is a milestone in computer gaming—one that challenges your physical and mental skills while testing the true fabric of your character.

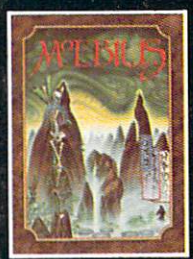
Enter Britannia, kingdom of Lord British. Journey through terrain of infinite proportions, conversing with characters on hundreds of topics. Unravel the mysteries of a superior magic system. At each turn beware of daemons, dragons and long-dead wizards haunting the most tranquil of places. Encounters with parties of mixed enemy types test your strategic abilities. Shrewd use of terrain can lead to victory against seemingly impossible odds.

Survive this multi-quest fantasy, then begin the final conflict, your quest of the Avatar. The ultimate challenge—the self—awaits....

ORIGIN SYSTEMS INC. 136 HARVEY ROAD, LONDONDERRY, NH 03053 (603) 644-3360

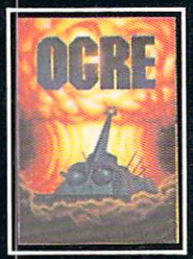


ULTIMA™ III sends you on an incredible fantasy role-playing journey through monster-plagued Sosaria in search of the elusive Exodus.



MOEBIUS™ takes you through the elemental planes of a colorful Oriental world of fantasy and adventure in search of the Orb of Celestial Harmony.

AUTODUEL™ is a futuristic, fast-paced strategy role-playing game where the right of way goes to the biggest guns.



OGRE™ is a strategy game fought on the nuclear battlefield of tomorrow as an inhuman juggernaut Cybertank battles conventional forces.

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